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INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

J. D. ROMAINE, *Chief Agronomist*

Editorial Office: Investment Bldg., Washington, D. C.

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American Potash Institute, Inc.

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J. W. TURRENTINE, *President and Treasurer*

SOUTHERN "ICICLES"—AN ATTRACTION FOR NORTHERN VISITORS

Better Crops with PLANT FOOD

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VOL. XXV WASHINGTON, D. C., JANUARY 1941 NO. 1

With the New Year Comes Faith in——

Starting Something

Jeff McDermid

JANUARY is the month arbitrarily marked down by humanity as a time to take a deep breath, spit on your hands, and get a "fresh holt" on life to start something; while if one has made a blotchy mess of the 1940 accounting, they give out a fresh page in January and expect a bum bookkeeper like me to balance the budget pronto.

There's no rhyme or reason why July or October wouldn't be just as suitable a time in which to reform, but it's customary to put it off until winter, mostly because a chap then has a better excuse for slipping. Oh, of course, January has been the month for shooting the starting gun ever since the ancients cooked up the story about Janus.

Janus was a mythical god who was presumed to face both ways like a successful modern candidate. He looked forward and backward hunting for an honest man (or was that the guy with a lantern?). Janus was credited with being a gatekeeper, before they gave Saint Peter the job. He is also listed as being the patron mogul of agriculture and commerce, although nowadays no one deity would hanker to tackle both those jobs at once any more than he would nominate himself to arbitrate between the CIO and AFL.

Hence there is some confusion existing yet about this Janus hombre, but I guess it's all right to pay him homage in a month so full of awkward confusion as January usually is in my township at tax-paying time. I am willing to grant this honor, such as it is, to old

man Janus, although I realize he is hopelessly behind the times with his limited two-way vision. In order to keep complete tab on things in our complex era, a god should have a revolving neckpiece geared to several thousand RPM.

IN January the first thing you are admonished about is to get rid of Status Quo. I don't know enough Latin to explain to you why Janus and Status Quo never seem to get along, but seems like we can't have 'em both and celebrate at New Years—and for a day or so thereafter. Status Quo must leave, no matter how plentiful your stock of good cheer may be.

I confess that Status Quo and I are buddies, and we have slept late together for quite a spell, so it will take more than Janus to part us. It's strange but true that many of my most radical friends seem just as attached to S. Q. as I am, despite the thought often expressed that only the conservative party is endeared to the stand-pat policy. They warn you against trailing around with Status and claim he is almost a corrupting influence. Yet just try to separate some of them from their private ideas, predilections, and propensities, and you'll find them sitting tighter than Hoover on the gold standard.

I have solved this puzzle to perfection. The radical extremists stick secretly to Status Quo in private diversions, but kick him all over the carpet for public amusement. So don't any of you write me asking how to slip away from Status Quo, because only one man in ten can do it, and the other nine wouldn't if they could.

Thus handicapped with the weight of habit and precedent, they admonish us next to start something. Anything will do, either a positive thing such as beginning a diary, or a negative thing like not keeping quite so many brands of liquid energizer on hand. Your experience and mine are probably identical here, so why take time showing how easy it is to propose and how hard to perform.

Old Status sneaks up ferninst me on the blind side and whispers that the pages of current history indicate that sometimes he who starts something is worse off than the indolent postponer. If I argue with him trying to keep square with Janus, he reminds me of such recent cases of misplaced ambition as shown by Mussolini & Graziani, Incorp., John L. Lewis, the New York Yankees, Tony Galento, and Al McCoy. They each and all claimed they were fully prepared for any emergency, had been in training for a long spell, and seemed fit, but yet they got behind ahead of time trying to start something.

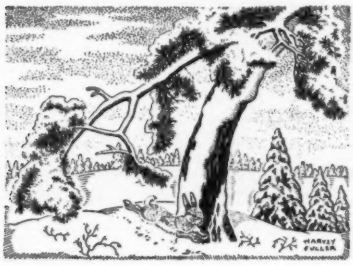
I have to admit that no high-sounding maxims may be brought up which will soothe wounded vanity like theirs, although one might salve them a bit by the phrase, "It is better to have bragged and lost than never to have bragged at all." I suppose we have to admit that our chances of finishing something we start are as good as the average, yet what holds us back seems to be a combination of laziness, timidity, fear of ridicule, and maybe lack of preparation. So I expect it would be good practice for us to barge along on some new scheme, just for personal training.

BUT New Years is not always the best time to launch it, because there are so many other new intentions under way that the competition is too keen for an amateur. The best time to reform is when reformations are scarcer. It'll be lots easier for the audience too. A first class, high geared, iron-clad, guaranteed original reform can easily be mired when there are too many others trying to use the same road in January. I can't possibly think of worse traveling conditions than to meet a lot of reckless reforms pushing for the right of way on icy highways.

But the lamest excuse for not starting something is the fear of not finishing it. I have a few neurotic acquaintances who find the world conflict a handy excuse for not attempting anything new or needful around their domiciles. About the closest they come to it is

buying a new model radio with an alleged "foreign band" on it, and when the screens should be painted or the front steps knocked together, they tune in on Europe to prove that money and time spent on anything short of "all out defense" is futile extravagance. These folks have what is known as "invasion inhibition."

Yet Americans of Napoleon's conquest era spent less time fretting about



the mess abroad, because they were not so well misinformed about the struggle every morning, and because they were too busy fighting Injuns and fever 'n ague to read calamity columns. Unfinished business overseas didn't bother the backwoodsmen, owing to a surplus of the same stuff right on the frontiers. It's when folks don't have any unfinished business of their own that they start to horn in on somebody else's.

Unfinished business holds no terror for me. I have more unfinished business and half-baked projects cluttering up the premises than the seventy-seventh congress. My precious litter of accumulated ambitions is a real museum. I expect my heirs to catalog them just to prove my versatility.

Here are four or five landscape paintings all blocked out, waiting for the sunrise. Had I flung on a daub or two more and hung them in one of our modern arty salons, my name might have become famous as a "subnormal primitive." Over yonder is a sheaf of poems which were turned down regretfully by Scientific American and the Butchers' Guide, but never got any further editorial consideration. Here is a fiddle whose strings have not been tortured since our suburb went under a restrictive zoning ordinance.

And note the little French primer I tried to master when my eldest girl began her high school language lessons, but the only word I could ever comprehend was "ennui." Finally, the lodge pins and regalia which repose in an old wardrobe of mine would almost serve for the Grand Triumphal Entry of Ringling Brothers and Barnum & Bailey. Why, when I look ahead and think of all the projects and programs I haven't even begun on, it is mighty fascinating. I'm not quite sure which it will be in 1941—golf, fly-casting, or knitting. Never put off until tomorrow what you can dabble with today.

THEN let us all not be afraid to tackle something new and fresh, provided it is a sane and stimulating idea. Something New—not merely something freshly varnished, brightly tinseled, temporarily ravishing; not a shibboleth to become shabby, a code to become corroded, or a racking headache due to vintage visions. Not holiday decorations soon to be put away against another revel; not the smears of a bold signature soon to be defaulted; nor toys of which we soon shall tire. Not the animation of the hour, soon to become jaded; nor the unbalanced hopes of the chronic optimist. No, let our type of Something New be a calmer, sounder, more universal, and homely spirit, which will be strong enough to make the ensuing months fruitful of courage and hope.

After all the greatest upheavals and revolutions in social life have come gradually through stern resolves which did not originate on New Years. There never has been any sharp line of demarcation between the period when old evils ceased and right triumphed. This is because folks may rashly lay plans and make promises, and yet the whole scene shifts slowly and magnificently by the weight of mass opinion.

Right now we lay our ears groundward and hear vibrations of some por-

(*Turn to page* 47)

Farmers inspecting a 10-year-old pasture at the Tennessee Valley Experiment Station, Belle Mina, Alabama.

Better Pastures in North Alabama

By R. M. Reaves

Alabama Extension Service, Athens, Alabama

THE permanent pasture program in north Alabama was inaugurated in the spring of 1936. Methods used in establishing two successful pastures, one on Dr. Young's farm in Lauderdale County and one on the Sub-station at Belle Mina in Limestone County, were followed in initiating the program. Pastures have been started on better than 3,000 farms since January 1, 1936, involving practically every soil type in the area.

Studies of these pastures from year to year, as well as records submitted by pasture demonstrators, have enabled extension agents and farm leaders to draw rather definite conclusions regarding the securing and maintaining of satisfactory permanent pastures. Five factors have been found necessary, namely, (1) selection of pasture area, (2) preparation of seed bed, (3) liming and fertilization, (4) seeding, and (5) management. Surveys indicate that 90 per cent of all permanent pastures have been successful, in the opinion of farmers and extension agents, where the demonstrator followed recommendations relative to these five factors.

1. *Selection of the Area*

Crop land that has grown one or two crops of winter legumes has given the most satisfactory results. Old pasture areas that have become sodded with undesirable weeds and grasses have given the most unsatisfactory results. Good land is as essential to good pasture

production as it is to good yields of other crops. Lowland areas adjacent to streams have afforded perfect pasture areas, from the standpoint of both production and nearness to water for the livestock. Eroded hills have not afforded satisfactory pasture areas.

2. *Preparation of the Seed Bed*

Failure to thoroughly prepare the pasture area prior to seeding has been the cause of a great many failures. A survey of a large number of pastures reveals the fact that 90 per cent of those seeded on properly prepared areas were satisfactory, while only 30 per cent of those seeded on unprepared areas were satisfactory. Turning a crop of winter legumes in the spring and fallowing the land during the summer have given best results. Where this is impossible, the land should be turned 2 to 3 months prior to seeding, the lime disked into the soil immediately after turning, and the fertilizer applied and disked or harrowed in 2 or 3 weeks before seeding.

3. *Liming and Fertilization*

Mineral fertilizers and lime are as essential for good pasture production as is nitrogen for good grain production. Areas properly fertilized and limed have produced not only twice the green weight, but plants that contained twice as much nitrogen, phosphorus, and calcium as untreated areas. Phosphate and lime alone have given good results on some soils. Potash has been found to be very essential on some soils and should be included in the fertilization program on all soils as an additional insurance.

Lime should be applied in accordance with the soil type. One ton on sandy soil, two tons on red soils, and three tons on gray or white soils have given desired results, provided finely ground material was used. All the lime should pass through a 10-mesh screen and 50 per cent should pass through a 60-mesh screen. The lime should be applied 2 to 3 months prior to seeding and worked into the soil.

Phosphate and potash may be applied either in heavy applications for a number of years or lighter applications annually. The equivalents of 1,000 pounds of 16 per cent superphosphate and 200 pounds of potash per acre have given excellent results for several years. Lighter applications of 300 pounds of 16 per cent superphosphate and 25 pounds of potash per acre annually have given very satisfactory results.

Basic slag may be substituted for lime and phosphate by using one ton of basic slag per acre prior to planting, if the heavy application method is to be followed, or an application of 1,000 pounds of basic slag per acre prior to planting and 500 pounds per acre annually will give excellent results. Under no condition should the annual application method be used unless it is to be adhered to each year.

4. *Seeding*

Seeding the pasture area to desirable grasses and legumes is absolutely necessary. Demonstrators have failed to get desirable pastures regardless of treatment, when the area was not seeded. Legumes should consist of White Dutch clover seeded at the rate of 2 to 4 pounds of inoculated seed per acre and common lespedeza seeded at the rate of 10 pounds per acre. (Two to four pounds of alsike clover per acre in addition to White Dutch and lespedeza have given good results the first year and appear to afford an excellent means of adding nitrogen to the soil.)

Grasses should consist of 5 to 10 pounds of Kentucky blue grass, 5 to 10 pounds of orchard grass, and 3 to 10 pounds of Dallis grass per acre. Seedings may be made partly in the fall and partly in the spring or all in the spring. If fall seedings are made, White Dutch clover, blue grass, and orchard grass should be seeded in September on a well-prepared seed bed. The Dallis grass and lespedeza should be added during the latter part of February or early March. Spring seeding should include all five kinds of seed and should be made during the latter part of Febru-

ary or first part of March. Late seeding either in the fall or spring has not been satisfactory.

The seed should be divided into two equal parts and cross seeded to insure an even stand. (One-half seeded east and west and one-half seeded north and south.) The seed should be covered very lightly. A cultipacker, roller, or brush drag has proved most satisfactory. Many of our demonstrators have failed to get a stand, due to the fact that seed were covered too deep.

5. *Management*

Pastures, like cotton or corn, cannot be expected to give desired results unless given proper attention after seeding. Many demonstrators have expected the pasture to do the impossible and have overgrazed, allowed undesirable weeds to sap the fertilizer and moisture from the legumes and grasses, and have failed to run a harrow or drag over the pasture occasionally to scatter the droppings. Pastures should not be grazed for the first 3 or 4 months after seeding, and only lightly for the first year.

Governing the carrying capacity of the pasture by the height of the legume and grass growth has given best results.

The author examining growth of pasture mixture on the farm of C. C. Loyd, Jackson County, Alabama.

Four inches of growth should be maintained during the growing season. Overgrazing of pastures prevents sufficient legume growth to supply nitrogen for the grasses and has been the cause of a number of very poor pastures. Keeping the pasture free from undesirable weeds is as necessary as keeping the cotton field free from grass. Mowing, digging out, and hand pulling are necessary practices the first few years. If no weeds are allowed to grow until the sod is firmly established, they will give very little trouble thereafter. Failure to scatter droppings causes near them excessive growth that cattle will not eat. Scattering with a section harrow or drag equalizes the fertility from the manure and permits even grazing.

Temporary Pastures Necessary

Temporary pastures or grazing crops must be provided to supplement permanent pastures, if animals are to harvest the maximum amount of their feed. Crops that will afford grazing during late summer and early fall and crops that will afford grazing during winter and early spring should be used.

Kudzu affords the best late summer and early fall temporary pasture. Once established and properly managed, a field of kudzu will afford grazing for a number of years. Kudzu should be fertilized with superphosphate and potash at planting and cultivated and refertilized every 2 or 3 years. Overgrazing will kill kudzu.

Annual lespedeza or annual lespedeza and Dallis grass afford excellent summer and early fall grazing. The crop should be fertilized with superphosphate at planting. Satisfactory grazing may be expected for three years, including the year the crop is planted.

Sudan grass has given very satisfactory summer grazing in sections of the valley. This crop has three disadvantages, namely, (1) it must be planted every year, (2) it must be fertilized with nitrogen for satisfactory growth, and (3) it should be 10 to 12 inches high before grazing is started.

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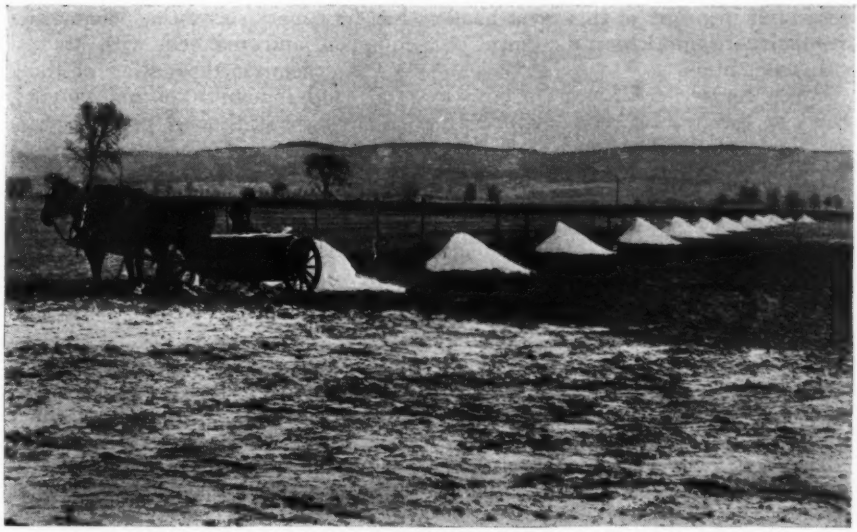


More than 4,000,000 tons of liming materials have been applied to Wisconsin farm lands in the past 7 years. The acreage of alfalfa has more than doubled during this period, and the yields and acreage of clover and other legumes have increased.

Our Defense Against Soil Fertility Losses

By C. J. Chapman

Wisconsin College of Agriculture, Madison, Wisconsin

NO matter what the outcome of this present world war and preparation for war may be, when the gigantic conflict has come to an end, there will still be millions of people on this earth whose chief concern is food, clothing, shelter, and a desire for some comforts and luxuries in a modern mode of living. Looking into the future economic and social status of the people of our own United States, we may well ask the question, "What does this future hold in store for our children, our grandchildren, our future generations?"

Fortunate it is, indeed, that before we launched this great national defense and military program, for several years this nation has been engaged in a peacetime program of national defense, a program concerned with the conservation of our great natural resources. Far and wide over this nation men have been considering very seriously this matter of our national well-being, not so much in terms of the immediate welfare of its citizens, but in terms of the well-being of generations to come.

For 25 years the writer has been called an alarmist. He was the "Wolf! Wolf!" story teller in extension activities in his efforts to arouse farmers in Wisconsin to an appreciation of the seriousness of soil fertility waste. And many older men who may read this article have like-

wise been members of this great band of missionaries preaching the gospel of soil conservation.

When the writer 25 years ago was hired to become the representative of the Service and Educational Bureau of a great eastern fertilizer company and undertake a program of educational work on soils and fertilizers in Wisconsin and Minnesota, he was looked upon with pity and disdain by many of his fellow colleagues. In his early work he was the object of many a skeptical criticism. But the combined results of the findings of experiment stations, extension workers, and teachers, through demonstrations and experiments, along with the results of work by the educational agencies of the fertilizer industry have long since built up a vast fund of information that has put aside any doubt as to the need for a program of soil conservation and the value and economy of using commercial fertilizers in such a program.

Big Strides Being Made

Tonnage reports for Wisconsin in 1940 indicate the largest use of commercial fertilizers in all its history. It is estimated that better than 55,000 tons of commercial plant foods were purchased and applied to Wisconsin soils.

Great strides in the program for liming the soils of the State have been made. In the past seven years a total of more than 4,000,000 tons of liming materials have been used. Crop reports for the past year show that Wisconsin produced the largest tonnage of tame hay in all its history; according to the Wisconsin State Crop and Livestock Reporter, "Exceeding 7¼ million tons, which is three-fourths of a million tons above the record crop grown in 1938, and more than a million tons above the production of any other State in 1940."

The Federal-State lime production program, W.P.A. soil-testing project, the help from the Federal A.A.A., the S.C.S., and F.S.A. agencies have all contributed to the growing interest in our soil fertility problems. The establishment of more than 50 county soil-testing laboratories equipped and manned with trained W.P.A. chemists, the testing of thousands and thousands of soil samples, with reports to farmers giving recommendations as to the need for lime and fertilizers, have had their effect. In many other States great progress has been made in arousing farmers to an appreciation of the importance of liming and fertilizing their soils. Many States can proudly point to as great or even greater accomplishments than have been witnessed here in Wisconsin. But even though the job in Wisconsin is far from finished, the interest which has been aroused and the support that has been gained through the help of thousands of men in associated educational agencies will push this program forward with increased momentum.

This past year in Wisconsin a total of more than 500 fertilizer demonstrations were conducted. These demonstrations were supervised by some 48 county agricultural agents in cooperation with A.A.A. county and community committeemen, assisted also by Smith-Hughes teachers of agriculture. The fertilizer industry through the Middle West Soil Improvement Association and the American Potash Institute furnished nearly 50 tons of commercial fertilizer for these demonstrations on small grain and legume seedings. The contribution of the Tennessee Valley Authority in supplying free phosphate for demonstrations in several counties, the assistance rendered by the manufacturers of farm implements (who furnished 23 demonstrator drills), the cooperation of all combined agencies resulted in a record year for demonstrations which show more convincingly than ever that Wisconsin soils are responding profitably to fertilizer.

In 86 per cent of all these 500 demonstrations, the increase in the yield of grain alone paid the entire cost of the fertilizer and left a profit. The residual benefit of this fertilizer to succeeding crops of hay will add further to the profit. In a high percentage of those

This picture of one of 500 fertilizer demonstrations conducted on Wisconsin farms in 1940, taken at an early stage of growth, shows the difference in the growth of barley on the various plots. The fertilizers were applied at the rate of 200 pounds per acre with a combination fertilizer drill.

Treatment	*Yield* *Grain*	*Straw*	*Value of Increases*	*Cost of Fertiliser*	*Net Profit*
0-20-0	55.7 bu.	2455 lb.	$ 6.63	$2.56	$4.07
0-20-10	62.4 bu.	2775 lb.	10.46	3.67	6.79
Check	42.9 bu.	2302 lb.	.....	.....	.....

(This field was seeded to clover and alfalfa and there should be increases in the yield of hay in 1941.)

cases where the value of the increase in grain yields was not sufficient to pay for the fertilizer, the increases in yields of hay in 1941 will offset losses incurred and will actually show a profit when the total value of increases in yields of grain and hay are totalled.

Summarized in Table 1 are the results of all 1940 demonstrations, where a direct comparison was made between superphosphates and phosphate-potash mixtures. The evidence revealed in the laboratory soil tests and actual field demonstrations point to the need for

TABLE 1—AVERAGE OF 141 DEMONSTRATIONS, OATS AND BARLEY (1940), WHERE A COMPARISON WAS MADE OF 0-20-0 AND 0-20-10

Soil Type	Treatment	Rate per acre	Average yield	Increase yield	Average yield straw	Increase straw	*Value of increases grain + straw	Cost of fertilizer	Net profit per acre
Mostly silt and clay loams	0-20-0	200#	60.6	11.8	2,792	447	$5.98	$2.56	$3.42
	0-20-10	200	63.9	15.1	2,959	614	7.72	3.67	4.05
	Check		48.8		2,345				

* Oats and barley figured at average value of 45c per bushel—straw at $3.00 per ton.

TABLE 2—AVERAGE OF 294 DEMONSTRATIONS (8 YEARS, INCLUDING 1940), WHERE A COMPARISON WAS MADE OF 0-20-0 AND 0-20-10

Mostly silt and clay loams	0-20-0	200	53.1	10.7	2,575	441	$5.47	$2.50	$2.97
	0-20-10	200	56.5	14.1	2,754	620	7.28	3.60	3.68
	Check		42.4		2,134				

potash in addition to phosphate on a high percentage of Wisconsin soils. For many years the need for potash on sandy and low black bottom soils has been recognized. But it was a revelation to find that a vast area (some 5,000 square miles) of heavy silt loam soil in north central Wisconsin is showing a marked response to potash. Even the silt and clay loam soils of southern, western, and eastern Wisconsin have shown a profitable response to potash in better than 50 per cent of the demonstrations conducted this past year.

The average of 294 demonstrations (shown in Table 2) conducted during the past eight years in Wisconsin shows the same general response to fertilizer treatment as shown in the 1940 results. By far the greatest and most important effect of the use of fertilizers applied to grain at the time of seeding is the influence which this fertilizer has had, not only on "catches," but on the increases in yields of hay the following year.

The average of 65 demonstrations where residual benefits to the hay crop have been measured is recorded in the summary shown in Table 3.

Yields of hay have been greatly increased. It should be noted that the relative response of the hay crop to potash is as great as the increase of grain from the phosphate-potash mixture the first year. True, the amount of actual potash carried over and available to the hay crop the second year is small, but the effect of potash in the mixture is very helpful in the establishment of the clover and alfalfa seedings the first year. It also gives the new seedings greater vigor and ability to withstand severe winters.

The indirect effect of potash in the mixture resulting in the establishment of deep-rooted, healthy plants is as much responsible for increases in hay yields the following year as is the actual amount of plant food supplied. Where only 200 pounds per acre of 0-20-10 fertilizer is used at the time of seeding, there is only about 10 pounds of actual potash carried over and available to the legume crop the following year. However, this 10 pounds of potash is sufficient to account for increases of 450 pounds of alfalfa or about 550 pounds of clover hay, and that is actually the average increase from the potash as shown in Table 3.

TABLE 3—RESIDUAL CARRY-OVER BENEFIT TO HAY CROP. AVERAGE OF 65 DEMONSTRATIONS

Soil Type	Treatment	Rate per acre	Average hay yields	Increase hay	**Value of increase	Average increase grain yield	Value of increase grain, hay & straw	Cost of fertilizer	Total profit per acre
Mostly silt and clay loams	0–20–0	200#	3,933	743	$3.71	10.7	$8.63	$2.50	$6.13
	0–20–10	200	4,325	1135	5.68	15.2	12.52	3.60	8.92
	Check		3,190						

** Hay figured at average value of $10.00 per ton.

We are now pouring billions of dollars into a national defense program to protect ourselves against the aggression of any power which threatens our way of life, but let us bear in mind that our future and ultimate security are of greater importance than any threat to our present political and social security. We cannot continue to live up to our national wealth in our present system of reckless spending, and that is what we have been doing for a period of over 100 years of farming in the Midwest.

Let us continue the fight we have so well started against the forces of nature and of human indifference and carelessness in this great program for the conservation and preservation of our greatest national heritage—the soil.

EDITOR'S NOTE: The following is a reprint of an old pamphlet published in 1846 and found in the Congressional Library in Washington, D. C. It is of particular interest because of its approach to our present-day "quick test" methods of diagnosing soil fertility and top-dressing with potash to control cotton rust. The name of J. Lawrence Smith is better known today for his work on methods of chemical analysis rather than his agronomic and soil investigations.

REPORT TO THE BLACK OAK AGRICULTURAL SOCIETY

on the

Ashes of the Cotton Stalk, the composition of Cotton Soils, and the nature of Rust in Cotton

By James Lawrence Smith

Assayer of the State of South Carolina; Member of the Annual Association of American Geologists and Naturalists; Cor. Member of the American National Institute of Natural History, &c.

Charleston: Printed by Miller & Browne, 1846

THE ashes left after the combustion of plants have, until a very late period, been considered merely as accidental ingredients, that varied in quality and quantity even in the same plant growing in the same region; this incombustible part was therefore looked upon as exerting no influence on the health and vigor of the plant.

The researches of modern chemists have proved the error of this supposition, by directing their time and labor and in applying knowledge acquired in the laboratory, to agriculture and rural economy in general; and although among the many views promulgated by them there is some error, the facts that have been brought to light will always make the agriculturist the chemist's debtor, and should teach him to regard with proper respect what may in his eye appear to be hasty generalization.

The chemist has pointed out by analysis that the ashes of plants of the same description, though growing in different climes, contain the same or similar ingredients. Thus, the pines of Norway and Italy when burnt, left earthy portions that are strikingly similar; these also being true of the oaks of the same countries, although these latter differed materially from the pines in the character of their ashes.

Let it not be understood that the amount of the different substances present in the ashes of the same plant is so identical as only to vary by the fraction of a grain; it is sufficient to bear in mind that the leading ingredients are the same, and the whole character of the ashes such as to enable us to infer that they belong to similar plants; the same is true for different parts of the same plants. Were it deemed necessary, numerous instances might be cited to prove the point in question, but any recent work on agriculture will convince the inquirer of this.

As the character of the ashes of plants is so invariable, it must occur to the minds of all that they play an important part in the economy of plants, and without them plants could not grow; such a supposition the most rigid and careful experiments have proved to be correct. It being also shown that the source from whence the ashes come is the soil, for plants create nothing, but only appropriate to themselves elements already existing, simply arranging them so as to give rise to certain compounds—forming their woody portions from elements existing in the atmosphere and water, and their earthy parts from the soil, which must contain all the elements necessary, as the absence of even one will be the cause of a sickly and imperfect growth.

Without dwelling further on this subject, everyone must see the necessity of having all of the required ingredients present in the soil or of supplying them

if deficient; therefore the importance of a knowledge of what is the composition of soils upon which we wish to grow certain plants. I do not pretend to say that with a thorough knowledge of the mere chemical composition of the soil all the planter's ends are to be answered, or that he will obtain the directions necessary for the improvement of his soils, as there are other properties of the soil besides its composition that influence the growth of the plant; as for instance its texture, which may be open or compact. If a soil contains all the substances a plant requires, and be compact and moist, when an open and dry soil alone is congenial to the plant, it will decay or arrive at imperfect maturity. It is for this reason that the chemist in analyzing soils has done so little for practical agriculture, he has allowed his views to become too narrowed and not examined sufficiently into other qualities of the soil. In fact the only way that practical benefit is to be derived is by careful investigation on their part, and patience on the part of farmers (who must have, in other ways, seen undeniable benefits arising to them from the chemist's labors). If this be attended to, in a few years incalculable will be their results to rural economy, and a method of analysis will be brought to bear upon soils that will answer all the required ends.

The subdivision of the parts of plants into earthy and combustible portions belongs also to animals—in the higher orders of which they appear in some degree separated from each other, the earthy parts constituting the mass of the bones. In others, however, as the worm, insects, etc., they are intimately blended as in the plant. The prominent ingredients also of the earthy parts of the vegetable and animal kingdoms are the same, which is a natural result, as all animals either directly or indirectly obtain their nourishment from plants. These ingredients are lime, phosphoric acid and potash, the two first more especially, and they may be considered par excellence the earthy ingredients of the animal and vegetable kingdoms, without a sufficiency of which neither one nor the other may expect a healthy growth. So then in studying soils these ingredients should particularly engross our attention as the subject of this report will show.

The ashes of a healthy cotton stalk six feet high and an inch in diameter at the largest part, with some leaves and empty pods, consists of—in 1000 parts:

Lime	303.
Potash	243.
Phosphoric acid	91.
Magnesia	58.
Oxide of iron	4.
Sulphuric acid	13.
Chlorine	8.
Carbonic acid	270.
Sand	5.

The half per cent of sand arose from what was on external portions of the stalk and could not be readily dusted off. The carbonic acid arises from the combustion of the plant and does not previously exist in it. The chlorine that is but a little over a half per cent, the sulphuric acid which is but a little over one per cent, and the oxide of iron which is not one half per cent, may be considered as ingredients of but little if of any importance to the plant. Thereby reducing the really important ingredients to phosphoric acid, potash, lime and magnesia; this last, however, is always to be looked upon in plants in the light of lime, and it can be replaced by lime entirely without prejudice to the plant. The analysis which I have made of the cotton wool and seed (but which do not form a part of the report), as well as the analysis made by others of the same, show that in these also, phosphoric acid, potash and lime are the important constituents. In the analysis of your soils, then, these have been particularly looked to, and with satisfactory results, except in the case of potash, which exists in such small quantities in all soils as renders it exceedingly difficult to collect and estimate; but I had hoped to overcome this difficulty if my duties did not now call me away from home.

(*Turn to page* 40)

A two-row planter-distributor combination, which applies fertilizer in bands on each side of and slightly below seed band or drill.

How, Where, When Apply Fertilizers?

By F. J. Hurst

Agricultural Extension Service, State College, Mississippi

AGRICULTURAL science marches on. Farm research advances. And the Nation's agriculture is made more productive and farming more efficient. The scientist in the laboratory, the investigator in the field, and the inventor in the factory, working on a common problem, have again contributed to the progress of agriculture. They have developed a new and better method of applying fertilizer that promises to benefit every farmer who uses it.

The new and more efficient way of applying fertilizer in large measure is the result of the investigations conducted cooperatively by the Bureaus of Agricultural Engineering, Chemistry and Soil, and Plant Industry of the U. S. Department of Agriculture and the experiment stations of more than 20 fertilizer-using States. The program was also actively sponsored by the National Joint Committee on Fertilizer Application, an organization set up in 1925 and composed of official representatives of the American Society of Agricultural Engineers, the American Society of Agronomy, the American Society for Horticultural Science, the Farm Equipment Institute, and the National Fertilizer Association. Progressive manufacturers of farm equipment have kept pace with the progress made by the research worker in the field in adapting the discoveries to the improvement of fertilizer distributors and distributing attachments.

The efficient use of fertilizer is of the greatest importance to the farmers of this country, because they use around

7,500,000 tons annually at a cost of over $200,000,000. For a long time, farmers have known that they needed to use the right kinds and the necessary amounts of fertilizers to restore plant-food elements removed from the soil by the harvesting and sale of crops, by the grazing and marketing of livestock, and by leaching and erosion, and to produce profitable yields of quality crops.

Placement Important

But in the light of recent research, farmers now need to learn that it is not enough to use the right amounts of the right kinds of fertilizers, they must also apply fertilizers in the right place. This is the new and highly important fact which the scientists have developed.

The trend of fertilizer practice in the South the past few years has been towards the use of high analysis fertilizers, since the value of a fertilizer is measured by the plant food it contains and its producing power in the field. Reliable experimental information has justified this trend, in that the high analysis mixtures mean a saving of from 10 to 20 per cent in fertilizer bills and greater producing power in the field.

For example, the high analysis mixtures, 4-8-8 and 6-8-8, recommended by the Mississippi Experiment Station, have been more profitable because they contain sufficient plant food in well-balanced proportions. The 4-8-8 contains 25 per cent more plant food than 4-8-4, and the 6-8-8 contains 37 per cent more plant food. This difference in plant food not only means a saving to the farmer in purchase price of the fertilizer, but increased profits in the field. The low analysis mixtures, 3-8-5 and 4-8-4, are not proving the most profitable mixtures to the farmer, and are becoming less popular from year to year. There has also been an increase in rate of application. This has called attention to the importance of proper placement of fertilizers in order to get the highest returns.

The results of many experiments show that it is usually much better to apply mixed fertilizer in bands at the sides of the row than to apply it under the seed. By using this method, the fertilizer is placed near enough to the seed or plants to be readily accessible and quickly available, and yet far enough from the seed or plants not to

A two-row cultivator and fertilizer distributor, which cultivates the crop and places the fertilizer in bands on the sides of the rows at the desired depth.

This distributor attachment for cultivators is commonly used in the Mississippi delta for side-dressing.

damage them. All of the fertilizer is applied more nearly within the main feeding area of the root system. So, the side placement in bands helps to assure better stands, increases early growth, hastens maturity of the plants, and apparently results in more complete utilization of all the fertilizer placed in the soil.

Placements Compared

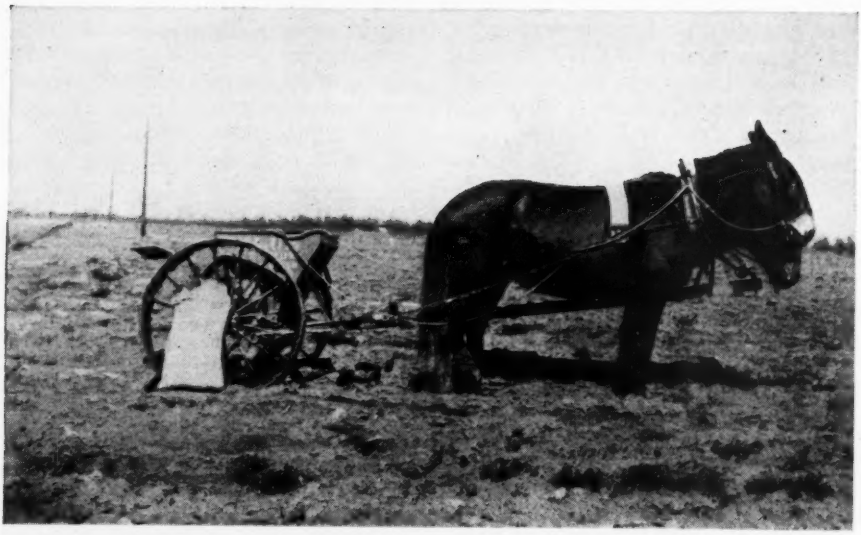
The Mississippi Experiment Station compared the two most common practices followed by hill farmers in fertilizing cotton with other methods. The common farm practices are: (1) Place the fertilizer in a furrow made by a bull-tongue or straight shovel, or in the old middle and bed on it; (2) Bed the land and later open the beds and apply the fertilizer, drag or harrow level, and then plant. Both of these practices place the fertilizer at varying depths more or less below the seed.

The Mississippi tests included the following: Fertilizer placed directly below the seed at different depths of 1, 2, 3, and 4 inches; to one side of the seed at different widths and depths, such as 2½ inches to one side and 2 inches deeper than the seed; to both sides of the seed at different distances and depths, such as 2½ inches to each side and 2 inches deeper than the seed. Placing small amounts of fertilizer in contact with the seed and the remainder at different distances, both to the side and below the seed, were also tried.

The results showed differences in yields as great as 389 pounds of seed cotton per acre with the same rate of fertilizer but with different methods of placement. The lowest yield was obtained where the fertilizer was placed 1 inch below the seed, and the highest yield where the fertilizer was applied 2½ inches to each side and 2 inches deeper than the seed.

The application of large amounts of fertilizer near the seed injured the stand. The placement of the fertilizer 2½ inches to the side and 2 inches deeper than the seed produced a 3-year average of 60 pounds of seed cotton per acre more than the practice of placing the fertilizer in the furrow and bedding on several days before planting.

In tests at the Edgecombe test farm, Rocky Mount, North Carolina, in 1933, 1934, and 1935, the side placement outyielded under-the-seed method by from 341 to as much as 1,115 pounds of seed



This two-row distributor in common use in Mississippi, more especially in the delta, is adapted for applying fertilizer in drill before bedding land. Applications should be made 10 days to 2 weeks before planting.

cotton per acre. The average, annual increased yield in favor of side placement for the 5-year period has been 474 pounds of seed cotton per acre.

Experiments were conducted in 1936 at four locations in three States (North Carolina, South Carolina, and Georgia) comparing three common methods of application employed by farmers with two side-placement methods. The average yields obtained for the methods compared were reported as follows:

Method of application	Average yield per acre	Increase due to fertilizer
No fertilizer	638	.....
Band 2″ wide under seed at planting*	787	149
Band 3″ under seed 10 days before planting*	971	333
Mixed with soil under seed before planting*	1,073	435
Bands 3″ each side, 3″ below seed level at planting	1,191	553
Bands 2.5″ to each side, 3″ under, 10 days before planting	1,275	637

* Common farm practices.

From these figures it is evident that all three of the farm methods employed were inferior to side placement. The average of the three farm methods was 306 pounds to the acre, while the average of the two side-placement methods was 595 pounds.

In experiments in the Southeastern States in which fertilizer was placed in bands on each side of the row, average yields of cotton were 253 pounds per acre more than when fertilizers were placed in a band 2 inches directly under the seed, and 104 pounds more than when fertilizers were mixed with the soil under the seed in a zone about 3½ inches wide. However, results obtained from placing the fertilizer to one or both sides of the seed do not vary widely.

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Further Shifts in Grassland Farming?

By Ford S. Prince

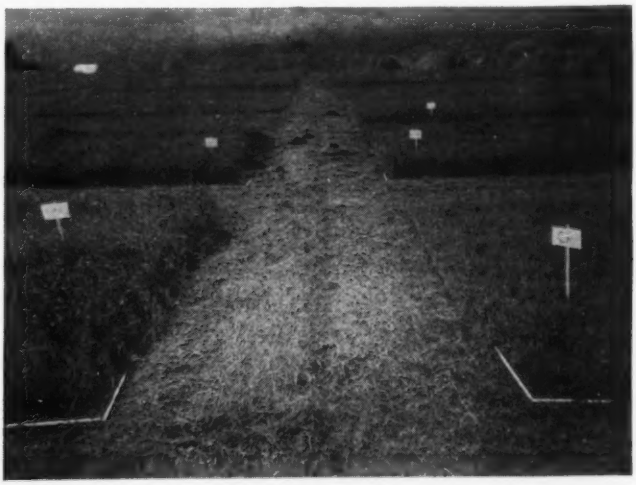
Agronomist, Agricultural Experiment Station, Durham, New Hampshire

ONE always sticks his neck out when he assumes the role of a prophet. Yet if a person tries to look ahead to see what changes are likely to occur in agriculture in the next 10 or twenty years, he cannot very well help prophesying a little, so my neck is out. And I think I can see a further trend to grassland farming in the northeast region, even though more than 80 per cent of the tillage land is already in grass.

For the past 20 years, many of us have been preaching shorter rotations and more cultivated crops. With the exception of potato growers, who have in reality shortened their rotations to avoid wireworm troubles as well as to increase the acreage of the crop on their own farms, there has been very little response to the rotation curbing advice. Dairymen, particularly, have been more or less adamant in this respect, and now it may be well to inquire why this has been the case.

In the first place, hay pays more per hour of labor spent on it than any other dairy farm crop. Secondly, the specter of a shortage of this roughage is always in the background, and should a new seeding fail, it might create a serious, although perhaps not an insurmountable situation. Third, most dairymen have been in the habit of using their mowing lands for fall pasture, and the fewer acres of hay lands they have, the less fall feed is available. Fourth, for some years, fertilizers have been tending to a lower price level, due to synthetic processes of nitrogen production and to the discovery and development of huge potash reserves in our own country. Cheaper fertilizers make it easier to maintain yields of hay over a long period.

Of course, there is always the problem of soil erosion on the hill farms. Probably few farmers would tell you



General view of the grass-legume fertility plots at Claremont, New Hampshire.

that they kept their fields in hay as long as possible to control erosion and stabilize the soil. Yet, in the background, there has doubtless been for years the knowledge that erosion, if allowed to proceed unhampered on the hill farms, cuts yields tremendously in a short time. Publicity about serious erosion is but a recent development. Still it seems probable that a certain knowledge of this menace has been handed down from father to son in many cases and amounts almost to an instinct in the minds of numerous farmers. Witness the plowing, throughout New England, of narrow strips of land in several large fields of the farm each year, instead of turning one whole field over. While these narrow strips have rarely been on the contour, they are always bordered by sod land, so that any soil which is removed will not be lost from the fields.

A Natural Trend

When I say there has been a trend toward grassland farming in the past, that is merely a matter of history. In our own State of New Hampshire, almost 90 per cent of the tillage land is in grass, and the other New England States are not far behind this figure. This is but a natural trend, for New England is a grass country. The soils, climate, and rainfall are all favorable to grass crops. (I use the term grass in its broad sense to include clovers and other biennial and perennial legumes.) Cool spring weather with ample rainfall is favorable to the grasses. Short, hot summers favor the clovers, not only yields but seed production, whereby the crop reseeds itself in old mowings under proper fertility conditions. From the standpoint of adaptation, therefore, the trend to grass has been and will continue to be sound.

Shift to Silage

The use of grass silage is now acting as a further spur to keeping more of the tillage land in grass. It is a matter of but a few years that farmers have known how to ensile the grasses and clovers and make good ensilage from them. This development alone justifies the prophecy that a further trend to grass is imminent and may, in the future, eliminate corn as a crop for the silo on many farms. It has already done this in a few instances, and since there are many very good reasons back of a change such as this, it seems likely the trend will continue.

Phosphorus alone does not appear to have much effect in improving hay yield, but when used with lime, nitrogen, and potash, increases may be expected.

What changes in farming practice will such a shift involve? Obviously, any shift toward a more intensive system of grassland management will require different methods of tillage and a much keener knowledge and appreciation of the part that fertilizers play in maintaining hay yields. Farm-produced manures will also have to be used

differently in the farming scheme than they are at present, if the fullest benefit is to be derived from them. Farm practice changes slowly, and for that reason alone farmers are very likely to feel their way along in the new program, arriving at the goal of intensive grassland management after some years of trial and error, rather than all at once.

If it were possible to sow a field to grass and maintain the yield for a period of years at the same level that is reached the first year or two after it is seeded down, the inclination toward a grassland farming system would be very much keener. At the moment, however, few farmers have the foresight to maintain the fertility of their soils at the proper point to achieve this goal. Still it can be done on the heavier soils, and there is ample evidence to prove it. At the Rothamsted Station in England, yields of hay have been maintained for over 80 years at the rate of more than 2½ tons per acre with suitable fertilizers. The Rhode Island Station reports an 8-year test where hay yields were maintained at 3½ tons per acre, whereas on land not adequately fertilized, yields fell from 2½ tons the first year to little better than one ton the eighth year.

High Yields Maintained

Here in New Hampshire, we have maintained alfalfa yields very close to a 4-ton average on land adequately fertilized with ample phosphoric acid and potash and a minimum of nitrogen, while on plots without any attention to chemicals, but with farm manure, yields averaged only a little over 2 tons per acre each year. The alfalfa killed out on the unfertilized plots, but a good stand was maintained on the heavily fertilized ones. In a number of tests with grasses in New Hampshire, yields have been maintained around a 2-ton level with chemical fertilizers alone, whereas plots not fertilized yielded only about one ton per acre.

Perhaps the most striking test we have conducted in this connection in New Hampshire is on the Livingston farm, Claremont, New Hampshire. On a field which produced corn that had been manured uniformly in 1936, we have maintained hay yields since 1937 at better than a 3-ton rate per acre, while plots not fertilized or plots from which potash was omitted have yielded at less than half this rate. Moreover, on all the plots treated with potash, clovers have persisted through the fourth season of hay, and last fall we took a second cutting from the plots treated with potash, while on the other plots, there wasn't enough hay to harvest.

Fertilizer Not So Costly

Results such as these indicate that hay yields can be held at high levels, and that plowing need not be so frequent, if farmers are willing to study their soils and the fertilizer requirements of their fields to find out how they can be adequately fertilized to maintain good hay yields.

"But," you say, "this is going to be more costly for fertilizers." And so it is. However, not so costly as it might seem at first glance, for in a grassland management system, farm manures will be used differently than at present. If the fields are not plowed so frequently, there will be more manure available for top-dressing. Since 8 or 10 tons of manure are ample for an acre in a top-dressing program, whereas farmers now use from 20 to 40 loads an acre for corn, these farm manures will go much further and cover a greater acreage than they do under the present system. This will cut down the need for chemical fertilizers, certainly to the extent that no farmer need be frightened over the proposition.

However, no one need think they can proceed successfully with the grassland management idea with what we now know as normal fertilizer practice. Each acre of land will need to be fertilized annually, except perhaps for the year after seeding, to maintain yields and to hold in the stand the most desirable and high-yielding hay plants.

(*Turn to page* 44)

Hunger Signs in Crops

(A Valuable Book for Every Agriculturist)

A NEW book which promises to be a valuable addition to agricultural literature is soon to be published by the American Society of Agronomy and the National Fertilizer Association. Agricultural science is keeping pace with medical science in studying nutritional diseases. Humans, animals, and plants have long been known to suffer some diseases caused by bacteria, but it is only recently, by comparison, that certain diseases and symptoms of disorder were found to result from improper feeding. "Hunger Signs in Crops," as its title implies, gives authoritative treatment to this "newer knowledge of nutrition."

For five years a group of interested scientists have worked on the idea of presenting this information to the public in a practical yet effective form, and a preview of their efforts indicates a thorough job, well done. They took an inventory of available facts and scheduled nine chapters to be written by competent scientists, each one a specialist on the crop about which he writes.

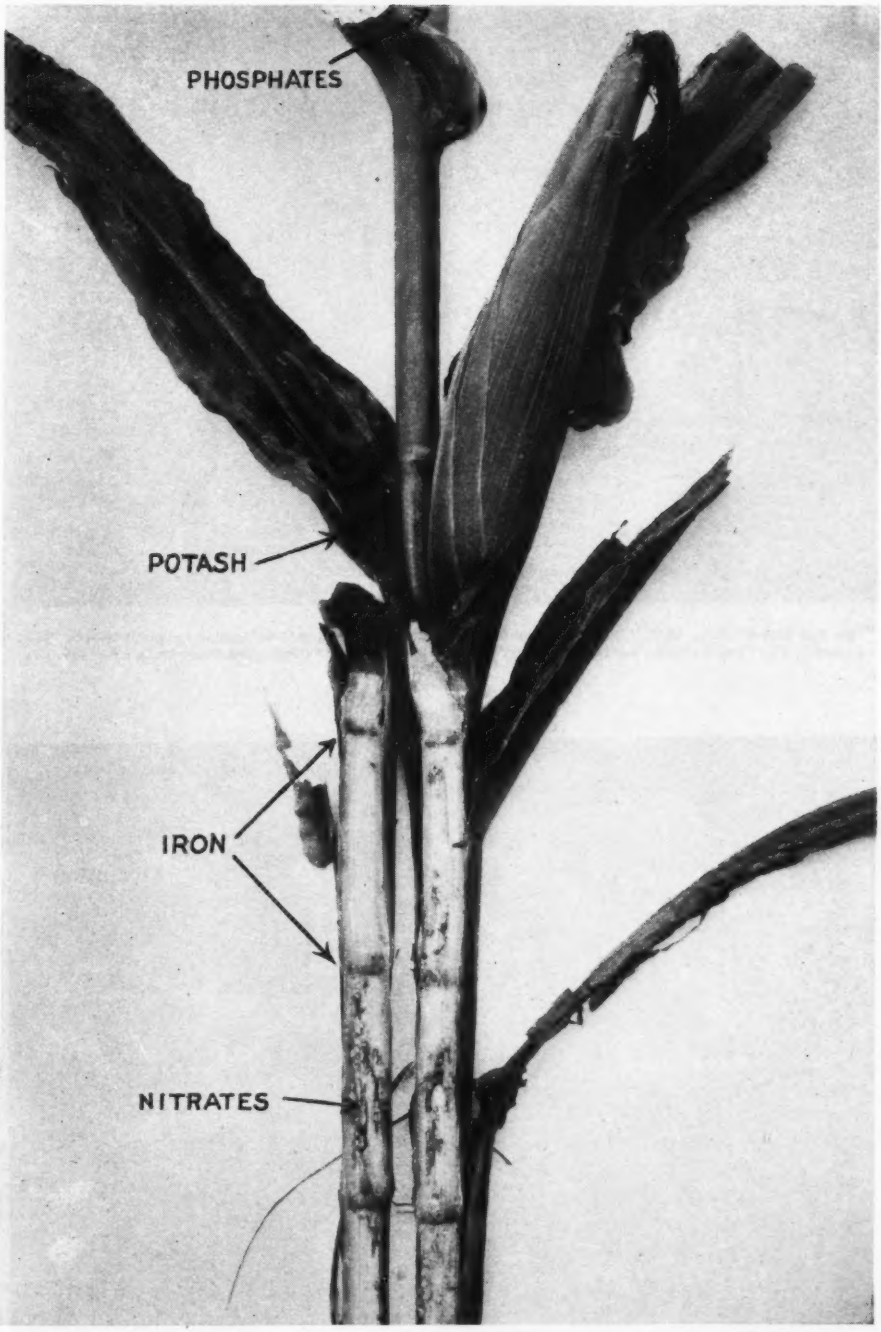
Chapter Authors Well Known

Dr. G. D. Scarseth and Professor R. M. Salter introduce the background of the problem with a discussion of hunger signs, how they are studied, and what they mean. The tobacco plant, which is shown to be especially well adapted to nutrition studies, is dealt with by Dr. J. E. McMurtrey, Jr.; Dr. H. P. Cooper summarizes the results of many experiments dealing with nutritional needs and hunger symptoms in the cotton plant. Using corn as an example for nutritional deficiencies in grain crops, Dr. G. N. Hoffer tells what is known about symptoms in the grains. Dr. H. A. Jones in collaboration with B. E. Brown shows what happens to potato plants that lack various nutritive elements, in the field and in experimental cultures.

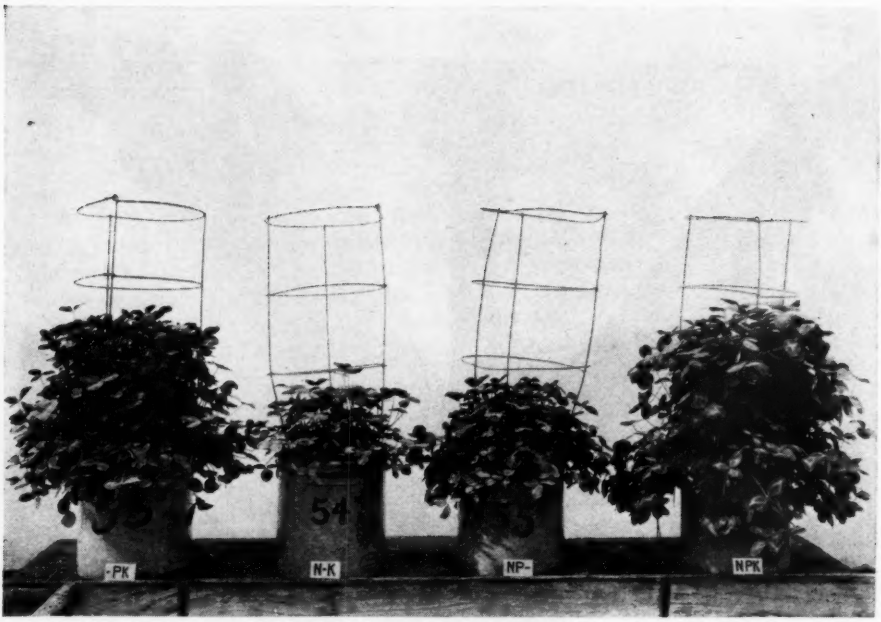
A wide range of crops important to truck growers, with major emphasis on deficiency symptoms in tomatoes, are reviewed by J. J. Skinner. Dr. E. E. DeTurk describes the hunger signs in legume crops that can get their nitrogen from the air but draw heavily on the soil for other plant foods. Dr. O. W. Davidson ranges over the orchards and tells what has been discovered about "hidden hunger" in these crops. Drs. A. F. Camp, H. D. Chapman, E. R. Parker, and G. M. Bahrt give a detailed and practical discussion of nutritional deficiencies in citrus fruits.

Such terms as "fired" corn, "sand drown" in tobacco, "dieback" in citrus, "drought spot" in apples, "heart rot" in beets, "rust" in cotton are now more than worries to the farmer, they are specific symptoms with cause and effect, as well as remedies to prevent or treat the ailing plant. Eighty true-to-life color plates and as many black-and-white illustrations give convincing support to the reading matter and greatly enhance the value of the book. Its low price of $2.00 before publication and $2.50 thereafter is made possible only by the sale of a large number of copies in advance of publication.

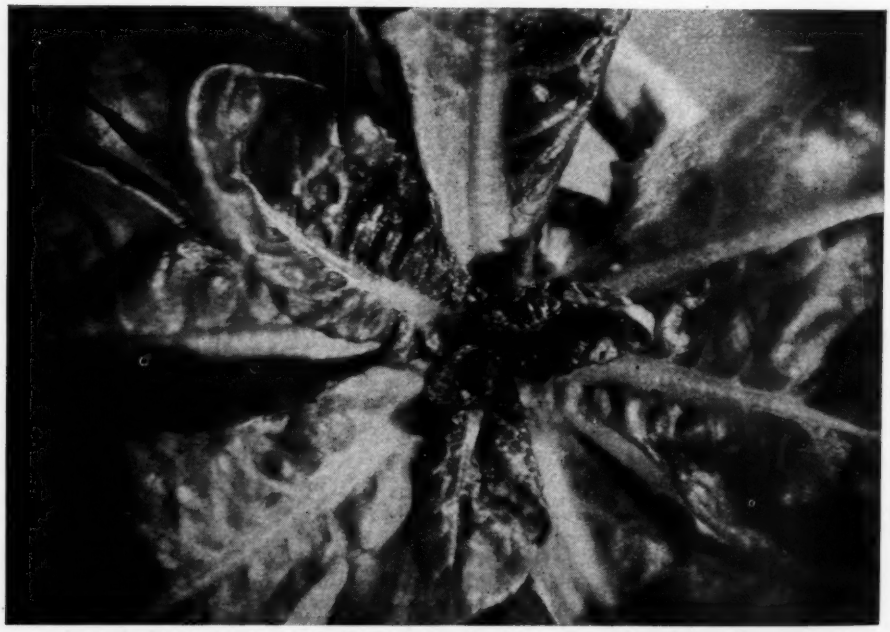
"Hunger Signs in Crops" will be an exceedingly useful book to county agents, teachers of vocational agriculture, extension specialists, libraries, progressive farmers who want to learn more about fertilizing their crops, scientists whose work touches this important field of nutrition, and members of the fertilizer trade. Gove Hambidge, its Editor, is to be commended on his easy flowing style which gives cold scientific facts life and readability. A few illustrations taken from the book are shown on the following pages.



When chemical tests are used to confirm nutrient deficiency symptoms in the field, they are made on the corn plant tissues as indicated. Tests for potash are made in the tissues in the base of the leaves. Iron accumulations in the joint tissues also indicate potash starvation. Tests for nitrates are made on the inter-nodal tissues throughout the plant, and for phosphates on stalk tissues just below the tassels.

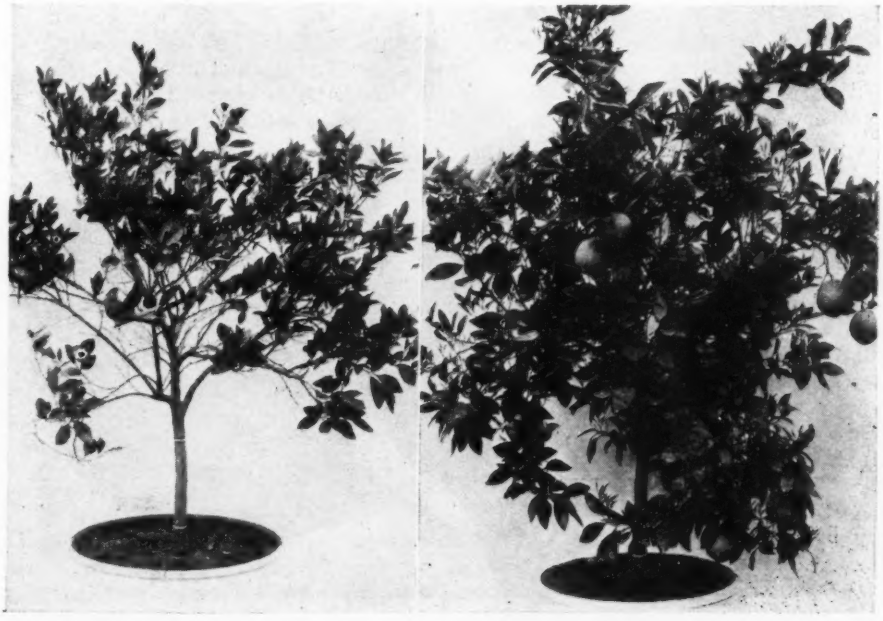


The red clover above shows the importance of phosphate and potash in making a good crop. The omission of either of these nutrients greatly reduces the growth. (Treatments are shown by labels.)

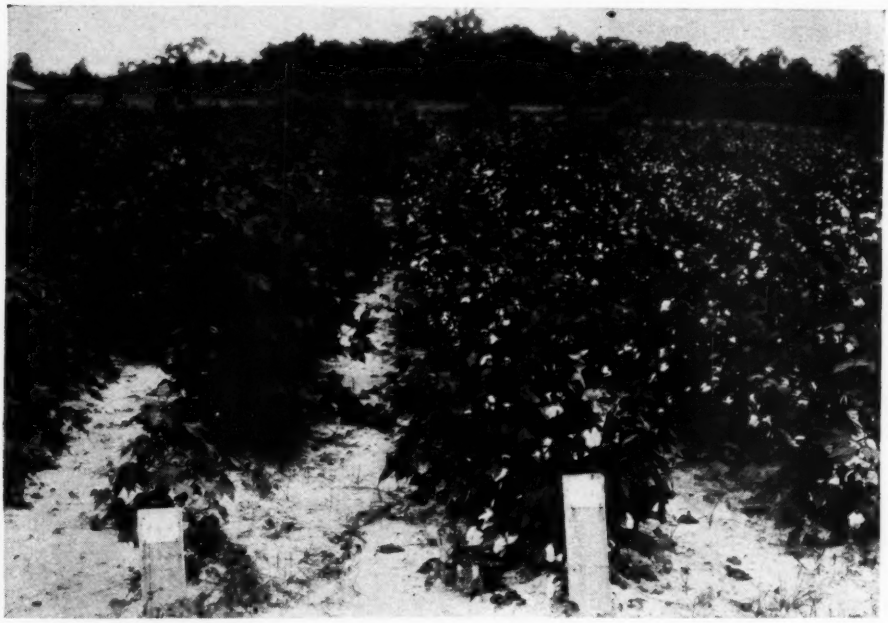


Growing point of lettuce plant showing symptoms of boron deficiency. Note the curling or folding back of the young leaves and the scorched appearance of the disfigured leaf tips.

The potato plants on the left, receiving no potash in the fertilizer, collapsed before making full growth. Those on the right, receiving potash, continued growing throughout the season.



Phosphate-deficient Navel orange (left) compared with tree of comparable age receiving phosphate (right). Note the restricted growth and fruiting on the phosphate-deficient tree.



The comparison plots above show the effect of phosphate deficiency on the growth and maturity of cotton. The plot on the left received no phosphate in the fertilizer; that on the right 8% phosphate.

This tobacco plant from a seedbed shows that even seedlings may be affected by potash hunger. Note mottling of leaf and scorching of the tips and edges.

The Editors Talk

Looking Ahead

The United States is beginning a new year which promises the highest level of business activity that this country has ever experienced. Undoubtedly the defense program is the most important issue in the outlook, but from all appearances the United States was scheduled to enjoy an expanding volume of business and a good business year in 1941 without the defense program. A great business backlog has been accumulating for some time coincident with vast supplies of idle funds crying for investment outlet.

One of the most backward of our business indices was that representing construction, but the time was surely coming when this country must enter an era of vast private construction programs. Such programs would include not only homes, but factories, office buildings, and various other types of construction. The automobile manufacturers are building more, and the sales of cars are much greater now than during World War No. 1. In addition, there are many consumer products sold in large volume today that were practically unheard of twenty-five years ago. Examples of these are modern refrigerators, radios, and air-conditioners.

During the present emergency, demands for goods of nearly all kinds will be greater than during the first World War, and American industrial volume has increased so that our industries are better able to handle the additional load that is being placed upon them by the defense program. There is a possibility, of course, that during the early stages of the program and until production bottlenecks have been ironed out, consumer goods will be required to give precedence to war materials. This may result in a decline in production of those commodities normally required to support our advancing level of living. In the end, however, there is no reason to believe that the United States with its vast resources and trained manpower cannot superimpose a vast defense program on its existing industries without disrupting our standard of living.

In 1939 the national income was approximately 70 billion dollars. In 1940 it is estimated to be between 74 and 75 billion dollars, and for 1941 the experts agree that it will exceed 80 billion dollars. The encouraging fact in connection with this increase in income is that it is not expected to be brought about so much by an increase in prices and a depreciation of the value of the American dollar, but through increased production for war and civil purposes. The greatest national income that this country has ever enjoyed was in the boom year of 1929 when it approximated 83 billion dollars. In that year our general price level was much higher than it is at the present time, therefore our 1941 income should represent a larger volume of production than that in 1929. All of this increase in national income and in physical output of industry must surely result in a continuation of our downward trend in unemployment, an increase in retail trade, and an expanding domestic demand for farm products.

During the World War No. 1 the cost of living increased tremendously, but there is nothing in the present situation to indicate a material increase in retail

prices. This means that the physical volume of consumption of nearly all of our agricultural and manufactured products may be expected to increase more in proportion to the increase in wages and income payments than was the case in the first World War. It is true that farm prices apparently have fallen out of proportion to other prices since the depression and have been unable to regain their parity, but the favorable aspect of this situation is that present prices will foster an increased volume of consumption, and that is the one thing that American agriculture needs most at the present time.

During the first World War the United States was called upon to supply food products to nearly all of the European countries on the side of the allies. These included Great Britain, France, Italy, Russia, Japan, and many other neutral nations. At the present time, however, England is the only important foreign consumer of our agricultural products. For the time being the American farmer has lost the export market, and exports of farm products during the coming year are expected to continue at low levels, with England as the only important buyer.

Fortunately the importance of the export market to the American farmer has declined considerably since the beginning of the first World War. In the last few years we have learned much about protecting ourselves against price declines in emergencies such as the one we are now facing. The American farmer can, therefore, look forward to the new year with the prospect of a cash income which will have a purchasing power higher than that received in 1940.

Country Editor and County Agent

There is nothing closer to one's interest than his immediate surroundings, the people he knows, and the happenings in his local community. This is the basis of a teamwork between the country editor and the county agricultural agent, teacher of vocational agriculture, and member of other local advisory groups, which has played such an important role in the betterment of American agriculture. Unfortunately the true nature of this teamwork has not always been fully recognized or appreciated to an extent where the greatest use might be made of it. It was gratifying, therefore, to see publicity given the recent tribute to country editor and county agent by M. L. Wilson, Director of Extension, U. S. Department of Agriculture.

"It is no exaggeration to say that the partnership of the county agent and the country newspaper editor has within the past 30 years brought about a revolution in farming methods," Mr. Wilson said. "The results are universally acclaimed. The implications for the future stir the imagination. While other continents are witnessing the growing depletion of the soil, America is actually reversing the process and is on the way to systematic rebuilding of this magnificent resource."

Mr. Wilson then went on to point out the alliance between country editor and county agent since the earliest days of extension work. The former was a means of widening the influence of the improved practices which the latter was attempting to inaugurate in the community, a service which the latter repaid by bringing in news of local interest to increase the standing of the publication. And both were performing services of untold value to the community as a whole.

Such a set-up deserves tribute. It offers the highest type of cooperative service, benefiting not only the participants, but the public. Effort should be made to take advantage of every opportunity to make further use of it.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ Maine Experiment Station Bulletin 402, "Boron Deficiency Symptoms in Some Plants of the Cabbage Family," by Frederick B. Chandler, gives a comprehensive description of boron deficiency symptoms shown by eleven economic members of the cabbage family. Work reported was begun at the Maine Station in the fall of 1933, a year when many of the rutabagas grown in the State were affected with water heart. This condition, however, was observed in Maine as early as 1914, but the cause was not known until 1933 when it was observed that applications of borax to the soil controlled water heart in rutabagas. In 1936 the investigations were enlarged to include ten other members of the genus *Brassica,* namely: broccoli, Brussels sprouts, cabbage, cauliflower, Chinese cabbage, kale, kohlrabi, white mustard, rape, and turnip. All plants have been studied in the greenhouse under controlled conditions and some plants have been studied in the field.

In general the entire cultivated area in the southern part of the State shows boron deficiency. The largest number of reports of this deficiency is from Scarboro and Cape Elizabeth. These towns were among the earliest to be settled in Maine, 1630. From the limited amount of information available, there seems to be a high association between boron deficiency and the date of settlement of the town, and little or no association between the deficiency and the parent soil material or the natural boron content of the soils type.

Accompanying the text are many excellent photographs depicting boron deficiency of the various plants, some portraying the contrast between plants so affected and those that are healthy and normal where a sufficiency of boron was supplied.

The deficiency may be corrected by the use of ten pounds of borax per acre applied in the row for row crops. Borax may be applied with the fertilizer, as a side-dressing, or it may be applied in solution as a spray. The author says that in setting out plants, boric acid solutions may be used, the solution being poured into the holes prepared to receive the plants.

"Relative Effect Upon Peach Production of Nitrogen Derived from Certain Fertilizer Sources," Agr. Exp. Sta., Newark, Del., Bul. 222, Jan. 1940, C. A. McCue.

"Fertilizers for New Jersey, 1941," Agr. Exp. Sta., New Brunswick, N. J., Cir. 406, Nov. 1940.

"Commercial Fertilizers, Pastures and Plant Food," Agr. Exp. Sta., Burlington, Vt., Bul. 464, Sept. 1940, L. S. Walker, E. F. Boyce, and H. J. Cannon.

Soils

¶ The production of vegetable crops has greatly increased in Connecticut during recent years and has come to be one of the important uses of Connecticut soils. According to M. F. Morgan and H. G. M. Jacobson, in Station Bulletin 439, entitled, "Soil Management for Intensive Vegetable Production on Sandy Connecticut Valley Lands," it is a well-known fact that the greater portion of the desired yield of vegetable crops must be obtained as a result of soil treatment. Land receiving no fertilizer, lime, or manure cannot be expected to produce satisfactory yields of any of the common vegetable crops. With a view of solv-

ing many of the soil management problems of vegetable growers, the bulletin presents conclusions of much importance as a result of ten years trials of various soil treatments.

A combination of moderate manuring and medium applications of complete fertilizer is most effective in producing high yields of miscellaneous vegetable crops without depletion of the soil. Liming acid soils sufficient to keep the reaction from 6.2 to 6.6 pH is necessary to produce favorable yields of spinach, lettuce, radishes, etc. A pH range between 5.2 and 5.6, with low amounts of active aluminum present, is not unfavorable to sweet corn, sweet potatoes, and tomatoes.

For most vegetable crops, fertilizers supplying 90 to 135 pounds of nitrogen, from 90 to 135 pounds of phosphoric acid, and from 120 to 180 pounds of potash per acre are desirable on unmanured land under intensive vegetable culture. Proportionally less than these amounts of nutrients may be used in connection with manure. It was found that manure gave best response when used at the moderately heavy rate of 20 tons per acre, in combination with a fertilizer treatment equivalent to 750 pounds of a 6-6-8. Smaller amounts of nitrogen are preferable in the growing of peppers and sweet potatoes in rotation with other vegetables. Increasing the potash treatment from 120 to 180 pounds per acre in the fertilizer trials produced larger yields of lettuce, squash, spinach, sweet potatoes, tomatoes, and sweet corn. The root crops were no more responsive to extra potash than other types of vegetables on this soil when well supplied with potash.

The soil management suggestions given in this bulletin are especially applicable to the light, sandy soils of the Connecticut Valley, but many of the fundamental principles revealed in these studies apply elsewhere.

"Dewitt County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Report 67, June 1940, Guy D. Smith & L. H. Smith.

"Jasper County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Report 68, June 1940, R. S. Smith & L. H. Smith.

"Cumberland County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Report 69, R. S. Smith & L. H. Smith.

"Soil Survey, Audubon County, Iowa," U. S. D. A., Washington, D. C., Series 1933, No. 34, Aug. 1940, T. H. Benton & W. J. Geib.

"Soil Survey of Iowa, Franklin County," Agr. Exp. Sta., Ames, Iowa, Soil Survey Report 79, Mar. 1940, Roy W. Simonson, T. H. Benton, & H. R. Meldrum.

"Save Your Soil," Maryland State Soil Conservation Committee, College Park, Md., Bul. 1, July 1940.

"The Control of Soil Erosion in New York," Agr. Ext. Serv., Ithaca, N. Y., Bul. 438, June 1940, A. F. Gustafson.

"Soil Erosion, Farmers and Government Together Can Whip It," Agr. Ext. Serv., Madison, Wis., Cir. 311, June 1940, Noble Clark.

"Soil Survey, Zavala County, Texas," U. S. D. A., Washington, D. C., Series 1934, No. 21, June 1940, Howard M. Smith, M. H. Layton, J. T. Miller, T. W. Glassey, R. M. Marshall.

"Use the Land and Save the Soil," U. S. D. A., Washington, D. C., 213934-40, June 1940.

Crops

¶ All dairymen recognize the fact that total digestible nutrients in the feed ration are usually most expensive in purchased grain. Professor R. W. Donaldson, in Massachusetts Extension Leaflet 150, "Pasture Management," gives a convincing comparison of costs for feeding dairy cows the different types of feed and shows that farm-grown roughage and pasture, even when fertilized and fenced, offer the cheapest source of total digestible nutrients.

Fertilized pasture feed is by far the least expensive, costing but $1.00 per 100 pounds of T.D.N., followed next by hay amounting to $1.50 per 100 pounds T.D.N. Comparative costs for concentrate (20%) and silage feeds are $2.63 and $1.87 respectively, per 100 pounds T.D.N. Thus, it is clearly seen that a farm producing ample roughage and having excellent pasture, with a sufficient number of good cows, should produce milk at the lowest price. With liberal roughage or good pasture, cows require only about half as much grain as is required when hay is fed scantily or when pasture is poor. Even a fair pasture calls for heavy grain feeding. This costly feeding can be reduced by about four-fifths on excellent pasture compared with a poor one or when roughage feeding is light.

The author briefly outlines the sources of pasture feed and suggests the fertilizer applications which may be used. A plan for a full season of grazing from May 1 to October 15 is graphically presented to illustrate how various crops may fit into a complete pasture program to supply excellent grazing. Covering nearly the entire span of the season and providing excellent grazing is Ladino clover. Ladino supports more animals to the acre, recovers from grazing more quickly, and suffers no more from mid-season heat than other pasture sod crops. Annual top-dressing with 300 pounds per acre of a fertilizer equivalent to 0-14-42, or 400 pounds of 0-10-30, is recommended to keep Ladino productive.

Rye furnishes late fall and early spring grazing, natural grasses intermediate, millet and Sudan grass late summer grazing during the period of greatest feed shortage, and rowen may furnish limited grazing in early fall, particularly for young stock and dry cows. Ladino, more often, is the main crop for grazing, to which may be added old pasture at its best and other supplementary grazing as required. All three may be required in dry seasons; in wet seasons any surplus may be ensiled or cut for hay.

Top-dressing for the permanent pasture on heavy soils moist enough to grow clover may consist of complete fertilizers of either 1-2-2 or 1-4-5 ratio for the initial treatment. Examples given are 8-16-16 or 4-16-20 at 300 pounds per acre. The 5-10-10 or 3-12-15 grades may be used at 500-pound rates. In subsequent years when clover develops, 240 pounds of 0-25-25, 300 pounds of 0-20-20, 400 pounds of 0-15-15, or 500 pounds of 0-12-12 may be applied. One ton of lime per acre once in 8 years may be used. For top-dressing the lighter, drier soils where grass is likely to predominate, fertilizer analyses as 11-11-11, 9-8-9, or 7-7-7 may be selected for the initial treatment. Respective rates suggested are 300 pounds, 375 pounds, and 475 pounds per acre. A good application of some nitrogen material would serve in alternate years. One ton of lime in 10 years is advised on strongly acid soils.

"Bur Clover," Agr. Ext. Serv., Fayetteville, Ark., Ext. Cir. 423, June 1940, Charles F. Simmons.

"Annual Report for the Year Ending October 31, 1939," Agr. Exp. Sta., New Haven, Conn., Bul. 438, Sept. 1940.

"Annual Report, State Board of Agriculture, 1939-1940" (Quarterly Bulletin), St. Bd. of Agr., Dover, Del., Vol. 30, No. 3, Sept. 30, 1940.

"Report of Progress in Solving Idaho's Farm Problems, Forty-seventh Annual Report for the Year Ending December 31, 1939," Agr. Exp. Sta., Moscow, Idaho, June 1940.

"House Plants," Agr. Ext. Serv., Ames, Iowa, Bul. P14 (New Series), July 1940, J. B. Wingert.

"Sweet Corn Hybrids," Agr. Ext. Serv., Ames, Iowa, Bul. P15 (New Series), Aug. 1940, E. S. Haber.

"Fortieth Annual Iowa Year Book of Agriculture," St. Dept. of Agr., Des Moines, Iowa, 1939.

"The Culture and Forcing of Easter Lilies," Agr. Exp. Sta., Amherst, Mass., Bul. 376, Aug. 1940, Harold E. White.

"Reed Canary Grass," Agr. Ext. Serv., East Lansing, Mich., Ext. Bul. 220, Oct. 1940, C. M. Harrison.

"The Judging of Livestock, Dairy, Poultry, and Crops," Agr. Exp. Sta., State College, Miss., Bul. 344, June 1940, H. O. West.

"Possibilities and Limitations in the Use of Irrigated Land for Forage Production in Northeastern Nevada," Agr. Exp. Sta., Reno, Nev., Bul. 154, Aug. 1940, C. E. Fleming & C. A. Brennen.

"Lawn Maintenance," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 430, Mar. 1940, Donald J. Bushey.

"Science for the Farmer," Agr. Exp. Sta., State College, Pa., Bul. 399, Sept. 1940.

"Questions and Answers Concerning the Use of Sericea in Tennessee, Prepared Especially for AAA Committeemen," Agr. Ext. Serv., Knoxville, Tenn., Sp. Cir. 133, Nov. 11, 1940, H. E. Hendricks.

"Truck Crop Investigations, the Control of Truck Crop Diseases in Tidewater, Virginia," Va. Truck Exp. Sta., Norfolk, Va., Bul. 104, July 1, 1940, Harold T. Cook & T. J. Nugent.

"Woodland Improvement, A Handbook for Farmers & Others Interested in Trees," Agr. Ext. Serv., Madison, Wis., Cir. 305, June 1940, Roy M. Carter.

"Chinese Cabbage Varieties, Their Classification, Description, and Culture in the Central Great Plains," U. S. D. A., Washington, D. C., Cir. 571, Sept. 1940, James E. Kraus.

"Useful and Ornamental Gourds," U. S. D. A., Washington, D. C., Farmers' Bul. 1849, Oct. 1940, W. R. Beattie.

"Gardenia Culture," U. S. D. A., Washing-

ton, D. C., Leaf. 199, 1940, Guy E. Yerkes, Furman Lloyd Mulford, Lucia McCulloch, and Floyd F. Smith.

Economics

¶ In Extension Bulletin No. 219 of Michigan State College Louis A. Wolfanger has presented in a most interesting manner the general aspects of conservation as it pertains to Michigan. The characters in the Bulletin include John Pioneer who settled about 1825 in an area rich in game and became a trapper and later a logger. Silas Pioneer was a farmer who settled in southern Michigan and cleared a farm in the smooth, gently undulating hardwood sections. Silas sold what logs he could and burned what he did not need for building, gradually pushing back the forest until he was finally surrounded by fields of grain.

Jack Pioneer was a miner. He settled in the copper country and the iron ranges. In those days miners were in demand and the wages were good. Steadily growing industries in the East provided a ready market for the products of the mines.

Peter Pioneer was a shopkeeper who settled in a port on Lake Michigan. He enjoyed and prospered because of the bustle of the village store and the hearty sociability of the lumberjacks and the lake crews.

Sam Pioneer came late in the century and was a lover of freedom. He settled in the northern part of the State and became a trapper, and later a lumberjack. Still later he worked at a job in a sawmill, and from time to time at odd jobs, finally mixed farming activities with trapping. He inherited a homestead in the south central part of the State where oil was discovered, bringing him such wealth as he had never dreamed.

The last of the Pioneer characters, Tom, took up farming in the stump lands of the north country. Markets for oats, hay, and potatoes looked promising, while the lumber towns were booming and busy. He liked the agricultural frontier, but he looked forward to the day when most of the land would be settled and his sons would occupy farms on either side of the old farmstead.

More than a century has passed since these persons began migrating westward and settling in Michigan. Their total number finally reached into the millions. Virtually all of the land worthy of private ownership had been settled, and good lakes, stream sites, and lake fronts had been taken up. Most of the choice forests and mineral and urban lands had been occupied and exploited. Within recent years new currents have set in; much land located in the northern part of the State and also scattered here and there in the southern part is being given up or abandoned. Approximately 6,000,000 acres at the present time have reverted to public ownership through tax delinquency or sale. A few years ago the State Homestead Act was repealed, marking the end of the free land and free resource era, and closing the door on the Pioneer period.

Today John Citizen and his relatives are taking the place of John Pioneer and his kinsmen. The Pioneers were primarily individualists, men who struggled and dreamed and worked alone, earnestly and with high courage. In those days the frontier demanded such men. The judicious use of resources in which the needs of tomorrow as well as those of today are taken into consideration was still strange and unknown, except to a few of unusually farsighted vision.

Citizens, according to the Bulletin, must be conservation minded, community builders—people who work and plan together for the community as well as for themselves. The maturing State depends upon them. Today it must be every man's concern if the lands, minerals, and waters are used to the best interests of all. The easy-to-take and easy-to-use resources have now been largely depleted. In the future the firm basis of life must be rooted in the more fundamental and enduring resources of the community, and these resources must be conserved, neither wasted nor hoarded. but used with

intelligence if the community is to continue its life on a wholesome basis.

Resources differ widely from the conservation point of view and because of this the conservation formula is not simple. Each resource must ultimately have its own conservation formula, but we can nevertheless recognize broad groups or types of resources whose problems are more or less similar and whose conservation will be sought in somewhat similar measures. For instance, there are exhaustible but renewable resources, and as good examples of this there are the forests and wildlife resources of the State. Next are exhaustible and irreplaceable resources, iron and copper furnishing good examples. There are inexhaustible but limited resources. As examples the author suggests recreational lakes, sites of scenic beauty and historic importance. Waterfronts constitute one of the most outstanding examples. These resources are not exhausted by use but are limited in amount and quantity. Next are inexhaustible and superabundant resources. Every community has these resources. Wind power, sun energy, gravitational force, tidal energy, etc., come under this category. There are indestructible but impairable resources. Land comes under this specification. Complete and absolute destruction of land is rare. In general its use for certain purposes is affected or destroyed but it still continues to exist as land. In the case of Silas Pioneer's farm, the land merely declined in agricultural productivity. This is serious, of course. The content of the all-important organic matter was reduced, and the smooth surface became broken by gullies.

The challenge to Silas Citizen lies in the task of discovering and learning the types of land in his community in the manner and detail which correspond to his understanding of his plant and animal resources and then in adapting his agriculture, forest and other uses of land to the qualities of the land. Such an understanding of land capabilities would gradually bring about a constructive revolution in land use. Crops, livestocks, rotations, fertilizers, pastures, recreational activities, forests, and other land uses would then be shaped to fit the land. Most efforts until now have been directed toward whipping the land into submission, whereas the fundamental qualities of most lands are more or less fixed—not unalterably so, of course, but such changes can generally be made only at considerable cost and effort. According to the author, the crux or pivotal point of soil erosion lies in the adjustment of land use to land quality.

Michigan has an area of nearly 60,000 square miles. About a century and a quarter ago there were 12 square miles of virgin forests for every man, woman, and child, if they had divided the State equally. The present population exceeds 5,000,000. If the State were equally divided today, each 90 Citizens would have to share one square mile between them, and there would be only scraps of virgin forests—about one-half acre for each. There is good reason, therefore, why the Citizens must insist that the days of needlessly exploiting resources must be numbered. They pay tribute to the courageous work of the Pioneers, but they believe that the time has passed when men should enjoy complete and unlimited freedom to utilize resources when and where they choose and without regard to the welfare of the community. Natural resources will continue to be the foundation stones of the twentieth century community, but their future use should be tempered by the peculiar nature of each resource, by sound conservation principles, and by effectiveness in rendering human services tomorrow as well as today.

"Commercial Fertilizer Sales as Reported to Date for the Quarter Ended September 30, 1940," St. Dept. of Agr., Sacramento, Calif., Bu. of Chem. Announcement No. FM-13, Nov. 23, 1940, Dr. Alvin J. Cox, Chief.

"Annual Report of Commercial Fertilizers, Agricultural Minerals, July 1, 1939 to June 30, 1940," Division of Agr., 20 State Museum, Denver, Colo., Mimeo., Nov. 1940.

"Farm Outlook, Illinois, 1941," Agr. Ext. Serv., Urbana, Ill., Cir. 511, Dec. 1, 1940.

"An Experiment in Pre-Harvest Sampling of Wheat Fields," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 273, Aug. 1940, Arnold J. King and Emil H. Jebe.

"Dairy and Hog Farming in Northeastern Iowa," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 275, Sept. 1940, R. K. Buck, J. A. Hopkins, and C. C. Malone.

"Cooperation in Grain Marketing in Iowa," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 276, Sept. 1940, Frank Robotka and R. C. Bentley.

"Seasonal Movements in Prices and Sales of Burley Tobacco," Agr. Exp. Sta., Lexington, Ky., Bul. 409, Sept. 1940, Dana G. Card and Carl M. Clark.

"Economic Utilization of Rural Land Resources in Beauregard Parish, Louisiana," Agr. Exp. Sta., University, La., La. Bul. 322, June 1940, Bueford M. Gile.

"Prices and Production of Louisiana Farm Products, 1910-1939," Agr. Exp. Sta., University, La., La. Bul. 324, June 1940, J. Norman Efferson.

"An Economic Study of Dairy Farms in the Kentwood Area of Southeastern Louisiana, 1937-38," Agr. Exp. Sta., University, La., La. Bul. 325, June 1940, J. Norman Efferson and Frank Merrick.

"Types of Farming in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 432, Feb. 1940, A. B. Hamilton and T. D. Johnson.

"Marketing Farm Products Through Community Auctions," Agr. Exp. Sta., College Park, Md., Bul. 434, June 1940, P. R. Poffenberger and S. H. DeVault.

"Fertilizer Grades and Fertilizer Materials to Be Registered and Sold in the State of Mississippi for the Year 1941," St. Dept. of Agr. & Com., Jackson, Miss., Mimeo., Oct. 25, 1940.

"Montana Farm Real Estate Mortgage Indebtedness," Agr. Exp. Sta., Bozeman, Mont., Bul. 383, Oct. 1940, R. R. Renne.

"Farm Organization and Management in the Colebrook Area," Agr. Exp. Sta., Durham, N. H., Bul. 322, June 1940, Harry C. Woodworth and Arno Hangas.

"New Jersey Prices of Hired Farm Labor, Feedstuffs and Fertilizer Materials, and Their Index Numbers 1910-1939," St. Dept. of Agr., Trenton, N. J., Cir. 314, June 1940, D. T. Pitt.

"Standard Fertilizer Grades for Texas, September 1, 1940 to August 31, 1941," State Chemist, College Station, Texas, July 18, 1940.

"The Possibilities of Producing Grain on Vermont Farms as a Cash Crop or for Livestock Feed," Agr. Ext. Serv., Burlington, Vt., Cir. 106, Sept. 1940, Hermon I. Miller.

"The Possibilities of Raising Small Fruits and Vegetables as a Source of Vermont Farm Income," Agr. Ext. Serv., Burlington, Vt., Cir. 107, Sept. 1940, Hermon I. Miller.

"An Analysis of Peanut-Cotton-Hog Farm Businesses in a Depression Year," Agr. Exp. Sta., Blacksburg, Va., Tech. Bul. 67, July 1940, F. L. Underwood.

"The AAA—What It Is," U. S. D. A., AAA, Washington, D. C., G-102, Aug. 1940.

"Cotton, Land, and People," U. S. D. A., AAA, Washington, D. C., SRM-428, July 1940.

"Cotton Marketing Quotas in 1941," U. S. D. A., AAA, Washington, D. C., 41-Cotton-1, Oct. 1940.

"Income Parity for Agriculture, Part I—Farm Income. Section 13—Income from Sweetpotatoes, Calendar Years 1910-39," U. S. D. A., Washington, D. C., Oct. 1940.

"Income Parity for Agriculture. Part II—Expenses of Agricultural Production. Section 2—Farmers' Expenditures for Fertilizer and Agricultural Lime, Calendar Years 1909-39," U. S. D. A., Washington, D. C., Oct. 1940.

"Income Parity for Agriculture, Part II—Expenses of Agricultural Production. Section 3—Purchases, Depreciation, and Value of Farm Automobiles, Motortrucks, Tractors, and Other Farm Machinery, Calendar Years 1910-39," U. S. D. A., AAA, Washington, D. C., Aug. 1940.

"1941 Agricultural Outlook Charts; Cotton and Tobacco; Dairy and Poultry; Demand, Credit, and Prices; Farm Family Living; Feed Grains, Fats and Oils; Livestock, Hogs, Beef Cattle, Sheep; Wheat, Rye, Rice, and Dry Beans;" U. S. D. A., Washington, D. C., Oct. 1940.

"Economic Analysis of the Food Stamp Plan," U. S. D. A., Washington, D. C., Oct. 1940, Norman Leon Gold, A. C. Hoffman, and Frederick V. Waugh.

"Make Surplus Cotton Work," U. S. D. A., Washington, D. C., 16-18143.

"Corn in the Development of the Civilization of the Americas, A Selected and Annotated Bibliography," U. S. D. A., Washington, D. C., Agr. Ec. Bib. 87, Sept. 1940, Louise O. Bercaw, Annie M. Hannay, Nellie G. Larson, and Mary G. Lacy.

"Directory of the State Land-use Planning Committees, as of June 30, 1940," U. S. D. A., Washington, D. C., Mimeo.

"Planning Committees Cooperate with Local Governments," U. S. D. A., Washington, D. C., County Planning Series No. 8.

"Farm Production, Farm Disposition, and Value of Soybeans and Cowpeas, 1924-1936," U. S. D. A., Washington, D. C., June 1940.

"Disposition of Potatoes, Crop Years 1909-1937," U. S. D. A., Washington, D. C., Sept. 1939.

"Achieving a Balanced Agriculture," U. S. D. A., Washington, D. C., Revised April 1940.

After looking at a moose, it seems that a man shot by mistake for one of them might as well be dead anyhow.

Then there was the husband who asked "By whom?" when told that his wife was outspoken.

Foreign and International Agriculture

To supply information on agricultural research and practice in other countries, brief abstracts of articles in foreign publications are given here. Due to space limitations, only articles of general fundamental interest are included, although the publications may contain other articles and reviews.

Die Ernährung der Pflanze, Vol. 36, No. 7, July 1940

THE INFLUENCE OF INCREASING POTASH APPLICATIONS ON THE YIELD AND COMPOSITION OF SOYBEANS. *By F. Giesecke and L. Yi-Lung, University of Berlin, Berlin, Germany.*

Somewhat conflicting results have been reported by investigators on the influence of potash applications on the production of protein in soybeans. In several cases it was reported that potash reduced protein production, although most work agrees that the potash will increase yield and oil content of seed. In order to obtain further information on the relationships existing, pot experiments were inaugurated in which a subsoil rather high in available phosphoric acid, moderately low in potash, and about neutral in reaction was used. Uniform amounts of calcium, phosphorus, magnesium, nitrogen (as ammonium nitrate), sodium, chlorine and manganese were added to all pots, while varying amounts of potassium sulphate were applied in different pots. Pure chemicals were used in all cases, and the soybeans were inoculated before planting.

During the first month there were no signs of potash starvation on the plants, even where no potash fertilizer was applied. As the plants became larger, distinct signs of potash deficiency became evident on the plants not provided with this nutrient, and on those given the lowest amount. Plants with the other four increments of potash fertilization all presented the same appearance so far as color was concerned. It was very noticeable that the potash-starved plants retain their leaves, although they were dead and dry, instead of shedding them normally. The plants with the highest potash application had thicker and shorter stems than the other plants.

Regardless of treatment, the number of pods per pot was not greatly different, but those from the plants lacking potash were small and many of them had set no seeds. The pods on these plants also were distinctly limited to the upper parts of the stems, in contrast to the rather uniform distribution of the pods along the stems of the potash-fed plants. The number of bean seeds per pot was much lower where potash was lacking, and over half of them were not mature. With increasing potash, there was a tendency for the number of seeds per pot to increase, and the percentage of mature seeds increased even more markedly. Accompanying an increase in seed production was a decrease in straw, which included stems, leaves, and pods.

The potash content of the seeds increased with the potash application. The per cent oil content of the seeds also increased but the per cent total nitrogen and also pure protein tended to decrease with increasing potash applications. The ratio of pure protein to total nitrogen was somewhat higher with increased potash additions, showing that the potash permitted a better utilization of the nitrogen in the plant. The production of oil per pot, of course, increased with potash applications, and the increased seed yield with such additions slightly more than balanced the decreased protein content, so the protein yield per pot was increased slightly by the potash treatment, except for the pot

lacking potash, which was much lower than the others in protein yield.

Considering the yield and composition of seed, the authors concluded that the most favorable P_2O_5:K_2O ratio in the fertilization was between 1:1.5 and 1:2, under the conditions of the experiment.

THE ACTION OF VARIOUS POTASH SALTS ON MEADOWS. *By L. Schmitt, Agricultural Experiment Station, Darmstadt, Germany.*

The author calls attention to the low yields too frequently obtained from meadows and points out that experiments have shown that by proper phosphate and potash fertilization yields of hay can be increased a ton per acre, with total yields of five tons and more per acre possible.

In an experiment conducted for 27 years on a good meadow soil, an application of about 100 pounds of actual potash per acre increased hay and rowen yield on the average a little over a ton per acre over plots where no potash was applied. In another experiment on poorer sandy soil, conducted for 22 years, the same amount of potash increased the yield about 1.5 tons per acre.

Attention is called to the fact that when potash is applied to the soil, other ions always are applied along with the potassium, these amounting to relatively large amounts in the case of the less concentrated potash carriers. Among the ions applied, chlorine, sulphate, sodium, magnesium, and calcium would be added in largest quantities. Little data will be found in the literature on the influence of the various potash carriers on the yield of hay and raw protein. This led to the establishment of experiments reported here covering the use of various potash salts applied to meadows on five different soils, and conducted over a period of years so as to give greater significance to the results obtained.

In an experiment conducted for 28 years on a moderately good soil, 110 and 145 pounds of K_2O per acre were applied in the form of muriate of potash and kainite and compared to a plot receiving no potash. Phosphate was applied uniformly over all the plots. The results showed that kainite at both rates increased hay yields about 1 ton per acre, while muriate of potash increased the yield about 1.25 tons. The higher kainite application tended to decrease the yield a little under the lower rate, while the higher muriate rate tended to increase the yield over the lower rate. The raw protein production was increased about 200 pounds per acre by the lower potash application, the higher rate not giving as good results as the lower rate, indicating that on this soil, 110 pounds of K_2O were sufficient. The muriate of potash tended to produce a little more raw protein than the kainite.

In another experiment conducted for 23 years on a sandy soil, kainite, 40% and 50% muriate of potash, sulphate of potash, sulphate of potash-magnesia and a combination of muriate of potash and magnesium sulphate were applied at 110 and 160 pounds K_2O per acre. Hay yields were increased on the average about 1.5 tons per acre by the more concentrated potash carriers; the less concentrated, such as kainite, yielding about a quarter of a ton less. Other than this, there was little difference among the concentrated carriers in their effectiveness. At the higher rate of application, the kainite produced a little less hay, but the concentrated carriers produced slightly higher yields than at the lower rate of application. Even greater differences between kainite and the concentrated carriers were shown in the results of raw protein produced. Magnesium was without appreciable effect on this soil.

On an experiment conducted on a peaty, sandy soil, large increases in hay and protein yields were obtained by potash applications, but only concentrated salts were used, and the results were about the same for all of them. On two fields where the soil was a sandy loam, naturally low in potash, the different potash fertilizers were compared with and without manure applications. The manure increased the yields in all

cases, but potash in addition to the manure increased yields even more. Here again, the kainite was not so good as the more concentrated carriers.

To see whether alternating the use of kainite and concentrated fertilizers would overcome the lower effectiveness of the kainite, the plots on the field that has been going on for 23 years were divided three years ago. On half the plots, the former treatments were continued while on the other half, a different potash fertilizer was applied during the last three years. When kainite was used on plots formerly receiving concentrated potash fertilizers, the yield was reduced, compared to the part of the plot which continued to receive the concentrated carrier. When concentrated carriers were used on the plot formerly receiving kainite, the yield was increased. In no case was the effect as good as the continuous use of the concentrated potash fertilizers. Interchanging the concentrated carriers had little effect on yield.

From this work the conclusion is drawn that on the soils studied, for each pound of potash used, about 21 pounds of hay and 2.7 pounds of raw protein were produced. (At even low hay prices, this would give more than 100% profit on the investment in potash fertilizer.) On meadows fertilized each year over a period of years, muriate of potash and the other concentrated potash carriers will produce better yields than kainite. Magnesium did not appear to be beneficial on meadows on any of the soils investigated.

NUTRIENT REMOVAL AND THE COURSE OF NUTRIENT ABSORPTION BY CAULIFLOWER. *By A. Wetzel, Berlin, Germany.*

Reviewing the data of several investigators, the author finds that with a yield of 22.5 tons of heads per acre, the average removal of nutrients is about 200 pounds of nitrogen, 70 pounds of phosphoric acid, 190 pounds of potash, and 80 pounds of lime per acre. The figures for potash and lime varied considerably with source of the data. Part of this may be due to the inclusion of several types of cauliflower.

Much of the article is devoted to a review of the work of Vanstone and Knapman of England, published in the June 1939 issue of the Journal of Pomology and Horticultural Science. The authors analyzed 50 representative plants at 6-week intervals from seeding to maturity. A crop of about 14 tons per acre was grown, the type grown being known as Roscoff broccoli, or winter cauliflower. Total dry matter produced by the whole plants amounted to 4,145 pounds per acre, nitrogen amounted to 137 pounds, phosphoric acid was 42 pounds, potash 166 pounds, and lime 119 pounds. It is pointed out that the crop was only moderately well fertilized and manured, and with larger yields, removals of plant food would be greater. It was found that plants producing good hard curds removed slightly less nitrogen, slightly more phosphoric acid and lime, and considerably more potash than plants producing soft curds. In this work there was comparatively little variation in composition of plants regardless of location. The absorption of all nutrients continued rather steadily until maturity.

The author of this article quotes other data showing that when the crop is grown under conditions of higher fertility, much higher amounts of the nutrients are removed, with nitrogen running over 200 pounds per acre, phosphoric acid over 80 pounds, potash 250 pounds and lime over 115 pounds. The high fertility requirements of cauliflower are shown in an experiment in which the crop was grown on a soil containing 29 mg P_2O_5 and 61.4 mg K_2O per 100 g by the Neubauer method. On this highly fertile soil in addition to nitrogen and phosphoric acid, three rates of potash were applied, zero, 270, and 360 pounds per acre. The average number of heads per plot was 374.5, 529.5, and 568.5 respectively, showing that large increases in yield were obtained with potash fertilization in spite of the original high fertility of the soil.

The number of good quality heads was also very favorably affected by the potash applications. Without potash, only 3 first quality heads were produced; with the first potash increment, 160 heads; and with the highest potash treatment 161 heads. The number of second quality heads was 210, 269, and 302 for the three treatments; and for the third quality heads produced, 287, 226, and 230 respectively.

THE SOIL OF THE ISLAND OF CRETE.

A map of the soils of Crete, accompanying an article on the soils of the Island written by K. Nervos and J. Zvorykin, is included as an insert with this issue of the magazine. The classification is based on the system of Gedroiz. Most of the soils are in the high lime group, particularly rendzina and red soils.

THE DISTRIBUTION OF THE SOILS OF JAVA.

Also reproduced in this issue is a soil map of Java prepared by C. I. Mohr, based on a system of classification worked out by him as adapted to the volcanic soils of the island.

How, Where, When Apply Fertilizers?

(*From page* 18)

Probably the most authoritative information on methods of fertilizing various crops is the recommendations of the National Joint Committee on Fertilizer Application. Here are some of the recommendations.

Cotton: Fertilizers, when applied simultaneously with planting of the seed, should be placed in narrow bands approximately 2½ inches to one or both sides of the seed row and 1½ to 2 inches below the level of the seed.

The Mississippi Experiment Station recommends that with the equipment used at present in the hill section of the State, the best practice would be to apply the fertilizer and bed the land 10 days to 2 weeks, or possibly longer, before planting. Care should be taken to see that the fertilizer is deep enough to be 2 to 3 inches below the seed.

Corn: When corn is hilled or checkplanted, fertilizer should be dropped at the hill and not drilled. Hill applications are best placed in bands 6 to 8 inches long, ½ to 1 inch to each side of, and from 1 inch below to slightly above the seed level. For drilled corn, fertilizer should be drilled uniformly in continuous bands in the same relative position as suggested for hill applications.

Fertilizer for potatoes should be applied in bands at the sides of the row. It should be about 2 inches to each side of the seed and from 2 inches below the seed to the seed level. On sloping land, in order to avoid fertilizer shifting too close to the seed, it is recommended that the fertilizer be placed about an inch below the seed level.

For sweetpotatoes, place fertilizer in wide bands on each side of the plants 10 days after setting, then cultivate fairly deep to assure mixing the fertilizer with the soil.

For small grains, applying the fertilizers at time of planting through the fertilizer attachment of the grain drill, which places the fertilizer close to and in partial contact with the seed, has been found superior to separate application, either broadcast or drill.

Information on application of fertilizers to other crops including important vegetables can be obtained upon request to county agents, the State Extension Service, or the National Fertilizer Association.

Obsolete Equipment

Many farms are not now equipped to take full advantage of new developments in fertilizer application. Much of the equipment on farms is obsolete in design and could be profitably replaced with modern and more efficient

The broadcasting type of fertilizer distributor in common use in Mississippi, especially the delta, is well adapted for pastures, hay crops, and small grains.

machines. According to the Bureau of Agricultural Engineering of the U. S. Department of Agriculture, there are in use on American farms 5,000,000 machines that apply fertilizer at the time of planting or as a separate operation before or after planting. Many of these are 10 to 20 years old and more or less obsolete in so far as fertilizer application is concerned. The Bureau says that many machines otherwise good could be modernized by new parts or attachments, and that the replacement of the others with modern machines, properly designed to place the fertilizer as herein outlined, should bring substantial returns on the investment required. Although manufacturers have made rapid improvements in commercial distributors, there are still many inefficient machines on the market.

According to a study of fertilizer-distributing machinery made by the National Joint Committee on Fertilizer Application, there are many different classes of fertilizer distributors. However, with regard to placement, all machines place the fertilizer (1) broadcast, (2) in spots or broken bands, or (3) in continuous rows. The Committee also classified fertilizer-distributing machinery into (1) machines used only for applying fertilizer, (2) combination machines for applying fertilizer and planting the crop in one operation, (3) combination machines for applying fertilizer and tilling the soil in one operation, and (4) machines for applying fertilizer in solution with irrigation water.

With so many different types of machines on the market, the farmer faces a problem in selecting the particular type of machine that will best meet his needs. Capacity for accuracy in applying fertilizers according to the latest recommendations should be given first consideration in choosing a distributor. Agricultural engineers say that a satisfactory machine should be capable of applying the fertilizer uniformly, with either broadcast or spot placement and with both light and heavy applications, should be easily adjusted for controlling the rate of application, should be adapted to the use of different types of fertilizers, and should be capable of applying both the lightest and heaviest rate likely to be required. The hopper should be large enough to avoid frequent refilling. Visible feeders, hopper agitators, and easy emptying and cleaning are also listed as requirements of a satisfactory machine.

Report to the Black Oak Agricultural Society

(*From page* 14)

The soils sent were marked by letters, the surface and the sub-soil from the same spot being designated by the same letter marked 1 and 2, respectively.

A.—Somerton near Somerset Creek, in 1000 parts.

	1	2
Sand	760	800
Clay	140	155
Moisture	30	25
Vegetable matter	70	20

The portion of 1000 grains of the soil soluble in warm muriatic acid furnished:

	1	2
Alumina	3.400	3.000
Oxide of iron	2.700	2.500
Lime	1.200	1.300
Phosphoric acid	2.000	2.300
Chlorine	trace	trace
Potash and soda	trace	trace
Magnesia	0.300	0.200

The following is a tabular view of the composition of the soils:

The following is a tabular view of the composition of the soils

	In 1000 parts				Portion of 1000 parts soluble in warm muriatic acid							
Soil	Sand	Clay	Moisture	Vegetable Matter	Alumina	Oxide of Iron	Lime	Phosphoric acid	Chlorine	Potash and soda	Sulphuric acid	Magnesia
A 1	760	140	30	70	3.40	2.70	1.20	2.00	trace	trace	....	0.30
A 2	800	155	25	20	3.00	2.50	1.30	2.30	trace	trace	....	0.20
B 1	800	170	10	20	1.20	1.10	1.00	0.16	0.06	0.08	....	....
B 2	850	132	10	8	1.15	1.20	0.60	0.17	0.04	0.06	....	....
C 1	680	270	20	30	1.30	1.50	0.41	....	0.36	0.52	....	....
C 2	700	252	18	30	1.32	1.40	0.51	....	0.25	0.42	....	....
D 1	800	166	12	22	1.20	1.54	1.52	0.29	0.12	0.03	....	....
D 2	850	122	13	15	2.80	1.60	3.32	0.36	0.57	0.45	....	....
E	900	62	8	30	0.63	0.36	0.12	....	trace	trace	....	....
F 1	860	55	25	60	2.60	0.35	1.20	0.05	0.29	0.20	0.56	0.10
F 2	905	50	25	20	2.80	0.36	1.40	0.06	0.28	0.15	0.57	0.05
G	700	253	22	25	0.63	0.90	1.10	0.02	0.32	0.40	....	....
H 1	810	102	28	60	6.20	2.30	0.71	1.15	0.23	0.52	0.51	0.25
H 2	870	95	20	15	5.50	2.10	0.85	1.21	0.12	0.60	0.30	0.10
I	760	200	10	30	2.25	3.00	10.40	0.22	0.15	0.08	....	0.38
J 1	730	150	40	80	5.20	8.53	1.60	0.08	0.04	0.02	....	....
J 2	775	140	45	40	4.80	8.20	0.85	0.08	0.02	0.01	....	....
K 1	760	130	40	70	5.40	4.50	4.62	0.26	....	....	....	....
K 2	783	125	42	50	4.50	4.02	3.21	0.28	....	....	....	....
L 1	825	140	10	25	2.30	1.50	0.45	0.12	....	trace	....	0.13
L 2	862	120	8	10	1.80	1.65	0.62	0.20	....	trace	....	0.15
M 1	820	100	30	50	1.10	0.95	0.42	0.06	....	trace	....	....
M 2	875	90	20	15	1.50	0.65	0.61	0.08	....	....	....	....
N 1	800	110	32	58	2.40	1.68	3.20	0.20	....	trace	....	....
O	850	100	25	25	1.80	1.42	0.55	0.05	trace	trace	trace	....
P	720	180	40	60	3.20	0.90	0.35	0.07	....	trace	....	....
R	705	250	20	25	3.30	2.50	1.26	0.03	trace	trace	....	....

From these analyses I should certainly conclude that A and H were the best soils, on account of the larger proportion of phosphoric acid contained in them. Of these two, I am disposed to think that H will be found the better, from it containing more potash, chlorine, and sulphuric acid than A, although it has not quite as much phosphoric acid; a little dressing of leeched ashes placed immediately around the plant will very probably improve the growth of the cotton. The next best, according to these analyses, would appear to be B, D, I, K, L, N. But B, D, and K are said to rust cotton, the cause of which I will allude to in another part of this report, at least so far as I have been able to make it out. All the others I should consider as being able to grow cotton fairly, except E, which would appear to be unfitted for almost any plant.

It is not the province of this report to enter upon the various methods of improving these cotton soils, but it may not be out of place to state one thing that occurs to my mind, bearing upon the wants of the plant and character of the soils. It is, to let the laborer when he thins out for the last time carry with him a bag containing a mixture of ground bones (about as fine as river sand) mixed with an equal quantity of leeched ashes, and at the root of every stalk he leaves standing, throw a good handful immediately around it. In fact there is little doubt but that it will be found far more beneficial as a manure than cotton seed, and requiring a much less quantity.

The Ashley river marls and all such marls as contain from 4 to 10 per cent of phosphate of lime will answer well to put on the top of the ridges after the planting of the seed.

In a letter received from Mr. F. A. Porcher, accompanying the soils, he stated that F and G are representations of soils not very rich, but very safe, and reference to my analysis will bear this out. I should have stated, although I have no mention made of what sort of soil C is found to be, that I consider it a very inferior one. If any general conclusion can be arrived at from the analysis, it is that cotton soils—everything else being alike—is valuable according to the amount of phosphoric acid present.

The last point to be considered in this report is that of rust in cotton, and here everything is to be learnt. Rust, as a term in agriculture, is in about the same position as that of dispepsia in medicine. It is a name given to a variety of diseases which have some resemblance to each other, but are widely different as to their causes. The rust properly speaking, and which so commonly attacks wheat, is certainly a kind of parasitic plant of the class of fungi, that grows on the stalk, leaves, etc., of the wheat and other grain, under certain disadvantageous circumstances of weather and season. The seeds of this parasite are wafted by the breeze to the spot where it germinates; it takes root into the body of the stalk and interrupts the maturation of the seed. This rust is somewhat the color of iron rust, from which it derives its name; it readily detaches itself, and when burnt, leaves a little ashes. Now I am not aware that rust of this description has ever been known to infect cotton; that which attacks cotton shows no fungus growth, but under the effects of it the plant becomes blighted, changes in color, and dies.

To arrive at the true cause of the rust of cotton, the planter will have, by very close examination, to distinguish between the different kinds (if there be any difference) and mark well the influences that are operating upon the plant at the time they occur. When he goes as far as he can in this, let him call to his aid the chemist, give him the rusted cotton stalk and a healthy cotton stalk of precisely the same size and growth, as well as a portion of the soil taken up at the time the effects are noted. In acting in this way, the planter may hope to find out the causes of this blight, and they will of course point out the remedy which, if practicable, will meet all the wishes and repay the labor of the planter. It is not a rigorous method of comparison to

examine the ashes of healthy and diseased plants unless they are of the same stage of growth, for ashes of plants differ with their age. Wheat-straw, just before the grain begins to form, contain some of those ingredients that afterwards abandon to a great degree the straw and pass into the grain, making a decided difference between the ashes of young and matured wheat straw.

My examination into the cause of the rust is very imperfect, not having been furnished, as you must now see, with the proper data to go upon in my investigation; but what has been done shall be made known to your body. I have no doubt that the peculiarity of seasons may produce these diseases as well as animalculae developed in the soil; but my firm belief is that noxious substances in the soil are frequently the causes, and they are more commonly some of the preparations of iron—the protoxide of iron especially. This protoxide was found by me in much larger quantities in D and K, particularly in K, than any of the other soils; in fact some of them contained none of it.

I can pronounce with but little confidence upon anything brought to light by the analysis of the cotton stalks, for the healthy and rusted stalks placed in my hands differed too much in size and age to furnish much information from the comparative composition of their ashes. But I did all that it was possible to do under the circumstances. There was decided difference in the amount of oxide of iron in the two ashes; in the ashes of the full-grown healthy plant it was only one half per cent, while in the ashes of the one diseased it was two and a quarter per cent. The phosphoric acid of the two did not differ materially, the healthy having nine and the diseased eight per cent. The proportion of lime was different, the diseased forty, and the healthy thirty per cent. The proportion of potash in the diseased was fifteen per cent, while that of the healthy stalk was twenty-four.

The protoxide of iron alluded to above is by exposure to the atmosphere, converted into the peroxide, a form from which no injurious effect may be expected, except when in very great excess; so I would suggest that in planting these lands, which rust cotton, as D and K, to disturb the surface as little as possible. This I know to answer in the case of certain soils that were examined for Dr. Townsend, of John's Island.

I am sorry that my unavoidable absence from America will render it impossible to prosecute these labors, commenced under the auspices of your Society, and I regret it the more since much time has been consumed in fixing upon methods best suited for carrying on these investigations. I hope, however, that the active part taken by you in inquiring into the true nature of the circumstances governing the growth of cotton will be crowned with the success it deserves, and that the report may aid in pointing out the right course to be pursued.

The wife awakened her husband.

"Good Lord, man," she squawked, "can't you quiet down a bit? You're snoring away at a mile-a-minute clip."

The husband pulled the blanket around his ears.

"Can't help it," he yawned. "I'm getting up very early in the morning and I've got to sleep fast!" . . .

"Daddy," said a six-year-old lad watching a farm auction, "what's that man doing to the cow?"

"Well son," said his dad, "he's examining her carefully. He wants to see if she's sound; he's probably going to buy her."

"Gee, Dad, we'd better get home before that brush feller who was at the house yesterday buys Maw."

General Horticulture

A Book Review

General information covering the entire broad field of horticulture has been collected into the book Textbook of General Horticulture by J. C. Schilletter and H. W. Richey of the Iowa State College. (McGraw-Hill Book Company, Inc., New York, 1940. $3.00.) As the name implies, the book was written primarily as a textbook, and the authors state in their preface: "The object of the present book is to set forth the essential principles of horticulture in a manner suitable for a general introductory college course."

The opening introductory chapter defines the field covered by horticulture, and gives its subdivisions into fruit growing, vegetable production, ornamental plants, and nursery stock and seed production. Horticulture production over the world as a whole and in the United States is discussed in the following chapters, showing by means of maps where the principal producing regions are located, and giving reasons for the developments in the particular areas. The following chapter becomes even more localized, and considers horticulture around the home. The layout of farmsteads with ornamental, small orchard, and garden plantings is given emphasis.

The next six chapters are devoted to horticultural plants as growing organisms, with brief discussion of how a plant is made up, its parts, how it functions, how it grows, how it feeds, and how it reacts to different temperatures, different moisture conditions, to light, and to soil conditions. Subject matter more strictly confined to the field of horticulture comprises the remainder of the book. There is a chapter on the propagation of horticultural plants, and another dealing with soil management from the viewpoint of the horticulturist. In the latter, sod mulching and clean culture in orchards are taken up, the plant-food elements and commercial fertilizers are briefly discussed, and information on irrigation is given. The next two chapters take up the principles of training and pruning, and following these are two chapters devoted to the important subjects of pests of horticultural plants and their control. Harvesting and storing what has been grown is the subject of the final chapter.

A Book of Principles

The book would appear to be well adapted to the purpose for which it was written. It is general and broad, with little attention given to details but with stress on principles. The authors state, "The approach to the subject-matter is from the viewpoint of fundamentals rather than from the culture of individual crops. Although the methods of performing certain practices are described in many instances, the emphasis has been placed on the reasons for the practices rather than on how they are performed."

It is difficult to take up in a single volume of ordinary size the broad field covered by the subject of horticulture, and when to this is added the great diversity of conditions under which the plants are grown in North America alone it is possible to deal only in principles unless an encyclopedic handbook is to be prepared. The authors intend that their book should be supplemented with material applicable to local conditions, but feel, and undoubtedly correctly so, that a knowledge of the principles will permit a more intelligent and efficient application of the detailed knowledge necessary in the successful production of plants and their products.

While the book is written for college students it can be recommended to all who wish to obtain a good background of horticultural knowledge.

Further Shifts in Grassland Farming?

(*From page* 21)

That this is not done under present farming conditions is indicated by the rapid decline of yields, as soon as the clovers disappear.

Even if a grassland system is more costly for fertilizers, it is considerably easier on the labor bills. Plowing will not need to be so frequent, and heavy hay crops that are difficult to cure will be put into the silo. This will ease up on hay-making charges. Moreover, the labor of filling the silo will be lowered, since hay crops are easier to handle than corn. The machinery costs of the farm will also be reduced, since no corn harvester, cultivator, or planter will be necessary, if corn is eliminated entirely. In short, the whole grassland management operation can be done with ordinary haying equipment. But the greatest saving of labor appears to be in hay making, especially during adverse hay weather, when silo filling can proceed, regardless of weather conditions.

Quite aside from costs is the advantage of being able to harvest hay when this should be done. Here in New Hampshire we have definitely established the fact that early cut grass carries more protein and has greater digestibility than that harvested later, and that second crops are likewise heavier when first crops are harvested early.

In a grassland system, all the hay can be cut at the stage at which it will be most valuable for feeding. Grass crops should be cut early, before the period of bloom, clovers and alfalfa can likewise be cut at the stage when feeding value is at its height. First cuttings of necessity will often be put into the silo, not only because of the need for silage, but also for the reason that the weather in mid-June is often adverse. Hay made during this period often loses a great deal of its nutrients and vitamins as well. These can be preserved without undue loss in the silo. Under such a system, all the roughage will be of high quality, and good roughage is one of the most potent factors for success in northeastern dairy farming.

Besides these shifts in fertility maintenance and in disposing of some of the hay crops in the silo, there is one other important change in farming practice that will have to be made. This refers to the seeding of hay crops, which will often be necessary to maintain yields and to keep legumes in the hay mixtures to as great an extent as possible. Under a grassland management system, plowing may be done after the first crop of hay is cut and the seeding made in July, August, or early September as conditions warrant. The idea of a quick summer seeding is to expose the soil to erosion as little as possible, never for a whole year, which is the case when corn is used as a rotation crop. July and August seedings are to be preferred to later ones, so that the new seedings will become well-enough established to control fall and spring erosion. Farm experience indicates that summer and early fall seedings of grasses and clovers are very successful, especially so on the heavier, well-watered soils that are most susceptible to and need protection from erosion.

This erosion menace has caught up with us, as it did the farmers of Europe centuries ago. Farmers there have already learned how to combat and control it. Grass crops are their chief asset in this respect. We, too, can utilize grass to further preserve our soils. But we cannot do it without changing our methods and making some shifts that are more or less revolutionary, and that will take a little time. Time to learn how these shifts may be made to advantage. Time even to adjust our mental attitudes so that these shifts will seem not only advisable but possible as well.

Small "Dose" of Boron Makes More Daffodils

A "spring tonic" for narcissus bulbs which makes them produce more stems, and consequently more daffodil blooms, has been discovered by Federal Department of Agriculture and North Carolina State College scientists.

In experiments at Castle Hayne, N. C., one of three narcissus bulb producing centers of the country, these workers found that 3 pounds of boron —common borax—mixed with commercial fertilizer applied at the rate of 1,000 pounds per acre, so stimulated the bulbs that flower yields were 10 to 25 percent more than when no boron was used.

Dr. S. L. Emsweller, in charge of floricultural investigations in the Department, reports that 20 different kinds of fertilizer were tested. The results for 2 years show that 6 treatments, including boron, topped the list in blooms produced—averaging in 1938 about 65,000 per acre with an average of 56,000 per acre without boron. The same bulbs replanted again gave in 1939, 70,000 blossoms per acre on boron plots and 54,000 on plots without boron. Roughly, 3 pounds of boron produced 9,000 more flowers in 1938 and 16,000 more in 1939 than without boron. It must be remembered, however, that the 1939 bulbs had received 3 pounds of boron per year for 3 years. The boron causes more "noses" to form on the bulbs.

The effects of the boron are delayed 1 year, because current season flowers form as "noses" the year before. For this reason home gardeners planting bulbs would not benefit from using boron. Too, since boron has a definite toxic effect on many plants, even in quantities as small as 10 to 15 pounds per acre the gardener should rely on the more experienced nurseryman to supply bulbs that already have their "dose" of the minor element. It is also possible that boron might not give the same results in localities other than North Carolina.

Trace amounts of minor elements often stimulate plants, says Dr. Emsweller. Trace amounts of magnesium, manganese, and copper were tried in the narcissus experiment, but only boron proved beneficial.

Corn Cost Goes Down As Acre Yields Go Up

Yield per acre is obviously the most important single element in determining the net cost of producing a bushel of corn, according to analysis by the Department of Agriculture, published in Crops and Markets. Tabulated costs for 1938 by groups of States in which conditions are generally similar, show that in Illinois and Iowa with yields averaging 45 bushels to the acre, the cost averaged 47 cents a bushel in 1938. Ohio, Indiana, Michigan, Wisconsin, and Minnesota corn with a 40-bushel average cost 59 cents. With a yield of less than 15 bushels to the acre, the southeast was the high cost producing area, averaging $1.08 a bushel.

Seed cost averaged 82 cents an acre in Iowa and Illinois, just about double the cost—38 to 43 cents—outside the Corn Belt. This reflects the widespread use of the more expensive but more

productive hybrid seed now available for the high yield areas. In the other Corn Belt States, seed cost averaged 68 cents an acre.

Net acre costs, including rent, fell into three distinct groups: $21.15 an acre for Iowa and Illinois, $22.31 for the Northeastern States, and $23.69 for the Corn Belt outside Illinois and Iowa. In other areas costs ranged between $12 and $16 an acre.

Land rent averaged $6.05 an acre in Iowa and Illinois, $4.83 in the rest of the Corn Belt, $4.67 in the Northeast, and from $2.37 to $3.57 elsewhere.

Better Pastures in North Alabama

(*From page* 8)

The three crops mentioned have an added advantage, in that they may be harvested for hay in years when weather conditions make supplementary grazing crops unnecessary.

Small grain, preferably barley, and crimson clover seeded on fallowed land in August have afforded most satisfactory winter and early spring pasture. Combinations of barley and crimson clover are recommended since the crop may be grazed until the middle of March, the livestock removed, and the seed harvested at one operation in June. As a general rule the seed crop will afford sufficient returns to pay the cost of fertilizer, seeding, and harvesting. The one disadvantage is the fact that fallowed land must be used. This crop should be fertilized with superphosphate and potash at planting.

Small grain alone or crimson clover alone, seeded on fallowed land in August, will afford excellent winter and early spring grazing. Livestock may be removed in March and fair yields of grain or clover seed harvested. Superphosphate and potash should be applied

This is 4-year-old kudzu on the farm of C. C. Loyd. Kudzu affords the best late summer and early fall temporary pastures.

to these crops at planting, and the small grain should be top-dressed with nitrogen soon after it is up to a stand. Lespedeza may be seeded on the small grain in late February or early March for summer grazing or for hay.

Crimson clover and rye grass seeded on pastures or lespedeza hay fields are being tried and may prove satisfactory. Two disadvantages have been found to date, (1) stands for early grazing are hard to secure and (2) an excess growth of either crop will crowd out pasture plants in the spring.

Starting Something

(*From page* 5)

tentous kind, presaging some great alteration in the rules of the world. Nerve-racking as it is to others exposed to the beat of these bitter forces, perhaps in the long run we shall be stronger for having lived in an age of tension and unrest. At least it is Something New, and even that is better than stagnation.

From long custom it has been common to chant the chorus of the bells at this interval—ring out the old, ring in the new. To be sure the cash registers have done most of the ringing, so much at times as to mask the holy music of the bells. Certain classes of society and certain types of minds have refused stubbornly to reject the old, however indecent, outworn, and moldy it may be. Others in the minority have yearned to usher in the new, but lacked the power or the concrete plan to carry out the change successfully.

BUT just the same we owe a debt of gratitude to the past. It brings out our errors, and what is more, it gives us a heritage of tradition. This tradition may be family pride, ancestral glory, clan fealty, or national loyalty—each and all resting on the bowed backs of the humble rather than upon the shields of swashbuckling fakirs.

By this I mean that the tradition for truth and justice and progress inherent in our national fiber gets its origin from the common run of folks like yours and mine. Such discerning citizens as they, pursuing the ordinary roles of life, are the ones who detect the false from the true in statecraft and public leadership. But yet more vital than this, they afford living examples to their associates, which in the end determines the final destiny of any country through its fixed mass opinions.

EVERY reader will treasure memories of those who walked the common road and made life brighter by their presence—not just for Christmas and New Years, but forever and always. That is where our citizenship is proud and strong.

No essay at New Years is complete without dragging in a reference to Tolerance and Charity. That is, such might be the case in normal seasons, but this time I intend to devote this one paragraph to the worn-out topic and quit. I am afraid that humanity is too far gone on the dual road of aggression and defense right now for any humble opinion of mine to matter much. Better give the aforesaid virtues a vacation, unless perchance they are so sick of the scenery around here that they've moved out for good.

But when it comes to Faith, luckily, we still have the farmers to rely upon as a sure source of that medicine. Yesterday I met a rural friend over at the machine shop, where he was buying a new three-bottom disk plow for the spring turn-over. He didn't realize that his simple chore was a supreme

evidence of faith, just the same kind we define as "the evidence of things not seen." It was almost criminal to ask him if he thought farmers had as much faith as big business or the industrialists.

EVERY year the farmer deals with hazards that are not human and are largely uncontrolled in the business of production. He is the greatest of gamblers, but not in the sporting sense of reaping huge profits or taking big stakes. He faces climatic uncertainty, and being ready for either a feast or a famine, he comes into the seed-time prepared to do his bit. The elements are at his elbow, and he meets the freaks of fortune, while the game of chance intrigues him from the clouds. He follows the round of seasons with calm precision, doing his customary duties and making his appropriate arrangements.

In abiding with faith like he does so regularly, the farmer doesn't have all smooth sailing. He also has his bogies and his ogres that gibber and jibe at him from dark spots along the way. Exposed as he is by dint of isolated residence and separate fields, even the modern farmer gets backed into bad corners sometimes by ghoulish ideas and cross currents of opinion. I think it is a great credit to his stability and his faith in average results, when we see him repeat new ventures on the scene of past failures. How many are there in other callings who can say as much?

I believe the farmer might well be taken as a text by New Years reformers who wish to convince narrow-gaged elements of society that this is a bad time to balk. Of course, the soil tillers have their moments of rebellion and frustration—times when they holler pretty loud and get red in the face; but somehow when spring comes along you'll find them all jogging into the fields to start something all over again.

Indeed I have often surmised what would happen if farmers stayed mad from mid-winter convention time to seeding season; if they decided to quit playing around in the back yards of America and took what they had left for a spree on main street. It would leave banks and government agencies with more land than they could handle and spoil the trading for countless emporiums. Economists would have to dust off that old word, "repercussion," again and watch it spiral across the continent kicking up a dust storm of troublesome events. If farmers decided not to start something in 1941, no amount of munition making or war propaganda would make up the difference to us in domestic security.

I guess we are all somewhat unmindful of the importance of a few simple realities right at home and get so chockfull of international bee-buzzing that we overlook the only things that really mean very much. Why, one good man-sized strike by all the capable farmers hereabouts would do more billy hell to America than all the airships from abroad.

I THINK this is the nugget for all of us to hang onto—namely, that we need to keep on starting something the best we know how, with a sort of inner fire and automatic stoking system like the farmers possess. Otherwise we just simmer along and cower around waiting for something to happen somewhere else. We become expert dodgers instead of competent doers. This practice hardly measures up to American history—at least "not the way I heeard it."

Well, this is about the end of my rope. Maybe I haven't said much or started anything wonderful; but as I said before, nothing in the way of unfinished business bothers me, and what I cannot complete now will wait very patiently, I am sure, for the moment when we meet again. Happy New Year!

No Hurry

The fellow stepped up to the door. He knocked and the door was opened by a beautiful blonde.

"May I speak to your husband for a moment?" asked the fellow.

"I'm sorry!" she said, "but my husband is away on business. He won't be back for at least two weeks."

The fellow pondered. "That's all right," he murmured, "I'll wait."

Man: Watcha cryin' for?
Boy: I lost my nickel.
Man: Where?
Boy: In Virginia.
Man: How come?
Boy: She swallowed it.

Early one morning, on the second day out, a terribly seasick passenger, pale and hollow-eyed, came out of his stateroom and ran into a lady, who was coming along the passageway, clad in the scantiest raiment. She screamed and started to run, "Don't be alarmed," groaned the man. "Don't be alarmed, madam; I shall never live to tell it."

"Pard'n me, shtranzher—wherzh other side uva shtreet?"

"Why, right over there."

"Thash what I thought, but I wuz zhust over there and they shed it wuz over here."

Wife: "Tomorrow is the tenth anniversary of our wedding. Shall I kill the turkey?"

Husband: "Why, what did he have to do with it?"

One trouble with many of us white folks is that we haven't developed a working philosophy like that of the fat negro cook down in Houston, Texas.

She was asked what was the secret of her calmness and freedom from care. Her reply was thorough and complete:

"Well, h'its disaway. When I sits I sits loose. An' when Ah stah'ts to worry, I falls asleep."

Old-fashioned

Sweet Young Thing—My boy friend has cold feet.

Fond Auntie—Shame on you, young lady. In my day we didn't find out those things until we were married.

Tourist (in mountains): This is a wonderful place. I'm sure I can get plenty of ozone here!

Native: Yes, stranger, all you have to do is to leave a jug and a half dollar at the side of the road; go away for five minutes and when you come back the money will be gone and the jug will be full.

FERTILIZER *Films* AVAILABLE

WE ARE NOW PREPARED TO LOAN without charge to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations and members of the fertilizer trade, several films bearing on the proper use of fertilizers, particularly potash. *Anyone interested in showing these films should direct their requests to our Washington office.*

Potash in Southern Agriculture

Covers fertilization and potash deficiency symptoms of cotton, tobacco, and corn in the various States of the South. Depicts experimental work now in progress at several Experiment Stations, also crops in the field, fertilizer placement work, and scenes in a fertilizer factory.

16 mm.—sound, color—running time 20 min.

Projectors will be loaned where necessary.

Potash From Soil to Plant

Sampling and testing soils to determine fertilizer needs, effects of potash deficiency on prunes, grapes, and Ladino clover in California.

16 mm.—silent, color—running time 40 min. (on 1600 ft. reel).

Condensed edition, omitting scenes on prunes and grapes, on 400 ft. reel, running time 15 min.

Please indicate size of reels desired.

Potash Deficiency in Grapes and Prunes

Effects of potash deficiency and fertilizer treatments on grapes and prunes in California. Typical nutrient deficiency symptoms and recovery due to corrective fertilization shown.

16 mm.—silent, color—running time 15 min. (on 400 ft. reel).

Bringing Citrus Quality to Market

Shows influence of fertilizers, particularly potash, on yield and quality of citrus fruit. Quality factors include thickness of rind, volume of juice, weight and general appearance of fruit.

16 mm.—silent, color—running time 25 min. (on 800 ft. reel).

Machine Placement of Fertilizer

Covers methods of applying fertilizer to California orchards, lettuce, and sugar beets. Shows scenes of various types of apparatus devised by growers for applying fertilizer in orchards and on row crops.

16 mm.—silent, color—running time 15 min. (on 400 ft. reel).

New Soils From Old

This film was prepared for the Department of Agronomy, University of Illinois. Deals with the experimental work on Illinois Soil Experiment Fields and stresses the benefits from a balanced soil fertility program using limestone, phosphates, and potash in growing corn, wheat, clover, and other crops.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Please indicate size of reel desired.

Fertilizers Improve Midwest Crops

Shows effects of proper fertilization on the growth of corn, wheat, alfalfa, and other crops in Illinois, Indiana, and Iowa. Includes potash, phosphorus, and nitrogen starvation symptoms and their confirmation by chemical tissue tests.

16 mm.—silent, color—running time 40 min. (on both 400 and 1600 ft. reels).

Please indicate size of reel desired.

Requests for these films should include information as to group before which they are to be shown, date of exhibition, and period of time of loan.

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